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ABSTRACT

This document contains 10 papers selected for presentation at a research conference on agricultural education. The titles are as follows: "Agriculture Students and Their Problem Solving Skills" (Rollins); "Agriculture Students' Preferred Styles of Learning" (Rollins); "Identification of Curricular Strategies for Enhancing Undergraduate Experiences in Colleges of Agriculture" (Lyons, Yoder); "Identification of Teaching Techniques, Strategies, and Styles for Use with Special Needs Students Enrolled in Vocational Agriculture" (Conroy, Baggett); "Relationships between Job and Marital Satisfaction of Secondary Agriculture Teachers and Their Spouses" (Cochran, Lawrence, Odell, and Gartin); "Job Satisfaction of College of Agriculture and Forestry Teaching Faculty at West Virginia University" (Cowie, Gartin, Odell, and Lawrence); "Major Problems Encountered in Administering Vocational Agriculture as Perceived by State Vocational Agriculture Supervisors in the United States" (Smith, Lawrence, Gartin, and Odell); "Microcomputer Use and Resulting Educational Needs of Farmers" (Escolme, Lancs, Bowen, Miller); "Perceptions of Agriculture Faculty at Land Grant Institutions in the Northeastern United States Concerning the Land Grant Mission" (Snively, Odell); and "Stakeholder Perceptions of Pennsylvania 4-H" (Etling). Also included in the proceedings are critiques of each paper. (KC)

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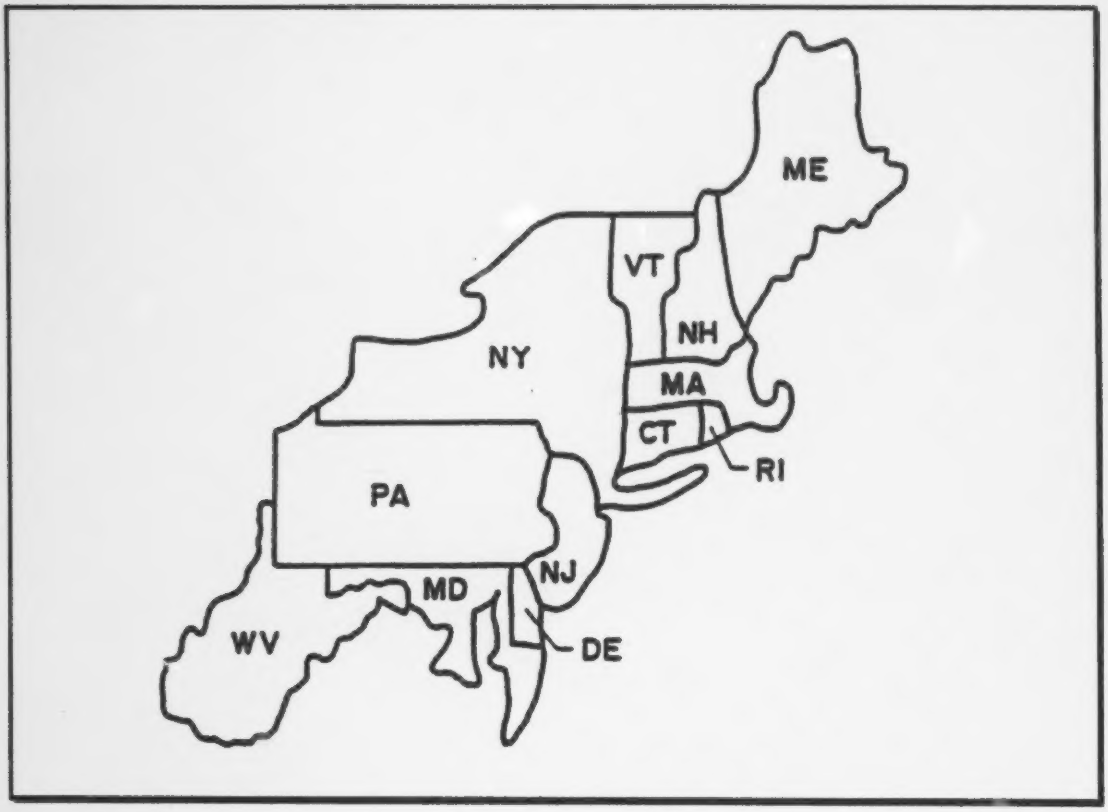
RESEARCH IN AGRICULTURAL EDUCATION



Proceedings of the 43rd Eastern Region Agricultural Education Research Conference

May 4-6, 1989
Mystic, Connecticut

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Volume 43 **May 1989**

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Research in Agricultural Education

Proceedings
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Ramada Inn
Mystic, Connecticut

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Al Mannebach, University of Connecticut
Stacy Gartin, West Virginia University

PREFACE

Research in agricultural education is conducted to confirm existing knowledge and illuminate the unknown. Toward this end, 13 paper proposals were submitted by professionals within the Eastern Region. Nine were accepted and one selected as the alternate paper. While most of the studies focused on different topics, common threads are evident. The papers in this volume focus on both formal and nonformal instruction, secondary programs, higher education, and adult instructional efforts.

Comments from referees and discussants who assisted with the Conference indicate that agricultural educators in the Region are conducting high quality research. However, these individuals issued two calls that should enhance the quality and quantity of research conducted within the Region. First, these professionals issued a call for more paper proposals to be submitted. Second, they requested that efforts be implemented to enable professionals in more institutions to become more active participants in conducting and disseminating agricultural education research. In this regard, a panel session on research collaboration among professionals within the Region was planned. Respected professionals who have been involved in regional research activities were asked to share their expertise. The Conference co-chairs believe that collaboration is an essential first step toward a long range goal of increasing both the quality and quantity of research conducted within the Region.

It is apparent that research has long been a high priority for agricultural educators in the Region. A 43rd annual research conference gives credence to the notion that agricultural educators are serious about using the research process to enhance and advance our knowledge of agricultural education. This conference continues and builds upon the Eastern Region's rich tradition of excellence in its research and development activities.

Conference Co-Chairs,
Alfred J. Mannebach, University of Connecticut
Blannie E. Bowen, The Pennsylvania State University

ACKNOWLEDGMENTS

The services of the following individuals were exceeding valuable in planning and conducting the 43rd Eastern Region Agricultural Education Conference. Special commendations are in order for Ms. Jamie Evans, a secretary at The Pennsylvania State University, for her creative efforts in designing and preparing the Proceedings.

Referees

Paul Vaughn, Mississippi State University
Gene Love, The Pennsylvania State University

Discussants

David Howell, University of New Hampshire
Arthur Berkey, Cornell University
Gerald Fuller, University of Vermont

Chairpersons

Ronald Seibel, University of Maryland-College Park
Ronald Grimes, West Virginia Department of Education
Milton Natusch, Connecticut Department of Education

Facilitators

Tracy Hoover, The Pennsylvania State University
William Thuemmel, University of Massachusetts
David Hall, The Pennsylvania State University

Conference Registration

Tracy Hoover, The Pennsylvania State University
Jeffrey Miller, The Pennsylvania State University

EASTERN REGION AGRICULTURAL EDUCATION RESEARCH CONFERENCE
Paper Proposal Evaluation Form

Evaluator: ______________________________ Paper No.______

Proposal Title: ______________________________________

Please rate the attached paper proposal on the following factors. When evaluating the paper for each of the factors, circle the number on the scale provided for the factor that most nearly reflects the value that you feel should be placed on the factor based on the scale descriptors at the top of each column of figures.

	Low	Weak	Fair	Good	Excel-lent
Significance of study to agricultural education	1	3	5	9	11
Literature review and theoretical/conceptual framework	1	3	5	9	11
Soundness of design and instrumentation	1	3	5	9	11
Soundness of sampling procedures and statistical analysis	1	3	5	9	11
Clarity of results with conclusions supported by findings	1	3	5	9	11
Contribution to knowledge about agricultural education	1	3	5	9	11
Organization of paper including writing style, grammar, spelling, etc.	1	3	5	9	11

Total score (sum of values you circled for the above items) __________

What is your recommendation for the proposal? (Check one)

_____ Include it in the program

_____ Reject it for the following reasons (it is important to share information with the author(s); your comments will be kept anonymous by name):

____

____

____

____

PROGRAM

1989 Eastern Region Agricultural Education Research Conference
May 4, 1989, 7-9 p.m.
Mystic, CT

7:00-7:05 **Conference Orientation,**
Al Mannebach, Co-chair
Blannie E. Bowen, Co-chair

7:05-8:30 p.m.: **Paper Presentations**

Topic: **HIGHER EDUCATION**

Session Chair: **Ronald J. Seibel, University of Maryland-College Park**
Facilitator: **Tracy S. Hoover, The Pennsylvania State University**
Discussant: **David Howell, University of New Hampshire**
Papers:

"Perceptions of Agriculture Faculty at Land Grant Institutions in the Northeastern United States Concerning the Land Grant Mission"
David Snively, Ohio Cooperative Extension Service
Kerry Odell, West Virginia University

"Identification of Curricular Strategies for Enhancing Undergraduate Experiences in Colleges of Agriculture"
Cathy Lyons and Edgar Yoder, The Pennsylvania State University

"Job Satisfaction of College of Agriculture and Forestry Teaching Faculty at West Virginia University"
Mary Lee Cowie, Stacy Gartin, Kerry Odell, and Layle Lawrence
West Virginia University

Topic: **TEACHING AND LEARNING**

Session Chair: **Ronald Grimes, West Virginia Department of Education**
Facilitator: **William Thuemmel, University of Massachusetts**
Discussant: **Arthur Berkey, Cornell University**
Papers:

"Agriculture Students and Their Problem Solving Skills"
Timothy Rollins, The Pennsylvania State University

"Identification of Teaching Techniques, Strategies, and Styles for Use with Special Needs Students Enrolled in Vocational Agriculture"
Carol Conroy, The Pennsylvania Council on Vocational Education
Connie D. Baggett, The Pennsylvania State University

"Agriculture Students' Preferred Styles of Learning"
Timothy J. Rollins, The Pennsylvania State University

Topic:	**SECONDARY INSTRUCTIONAL PROGRAMS**
Session Chair:	**Milton Natusch, Connecticut Department of Education**
Facilitator:	**David Hall, The Pennsylvania State University**
Discussant:	**Gerald Fuller, University of Vermont**
Papers:	

"Major Problems Encountered in Administering Vocational Agriculture as Perceived by State Vocational Agriculture Supervisors in the United States"
Sandra Smith, Layle Lawrence, Stacy Gartin, and Kerry Odell
West Virginia University

"Microcomputer Use and Resulting Educational Needs of Farmers"
Kathy Escolme, Carnforth Lancs, United Kingdom
Blannie E. Bowen, Jeffrey P. Miller, The Pennsylvania State University

"Relationships Between Job and Marital Satisfaction of Secondary Agriculture Teachers and Their Spouses"
James Cochran, Layle Lawrence, Kerry Odell, and Stacy Gartin
West Virginia University

Alternate Paper:

"Stakeholder Perceptions of Pennsylvania 4-H"
Arlen Etling, The Pennsylvania State University

8:30-9:00 p.m.: Panel Presentation on "Team Building"

INNOVATIVE RESEARCH COLLABORATION STRATEGIES FOR FACULTY IN THE EASTERN REGION
Dennis Scanlon, Chair, The Pennsylvania State University
Al Mannebach, University of Connecticut
Stacy Gartin, West Virginia University

AGRICULTURE STUDENTS AND THEIR PROBLEM SOLVING SKILLS

Timothy J. Rollins, Assistant Professor
The Pennsylvania State University
University Park, PA 16802

Knowledge alone is of limited value to competent human functioning without reasoning, thinking, and learning skills needed to use such knowledge in diverse situations. Students should possess the dispositions and thinking skills necessary to work with and solve problems; they must be capable of knowing, doing, and thinking.

Over 50 years ago, Lancelot (1929) described a person's knowledge and thinking ability as being of crucial importance for human efficiency and success in the then present age of science and technology. He attributed the success of solving problems encountered in every day life to a "general thinking ability."

Dewey's (1933) philosophical effort to define thinking--reflective thinking--was aimed toward improving an individual's thinking to "change his own personal ways until they become more effective; until . . . they do better the work that thinking can do and that other mental operations cannot do so well" (p. 3). Dewey also recognized the problem solving aspects of thinking in the second of his five phases of reflective thought.

There are diverse and numerous terms which describe these thinking and cognitive processes: higher order thinking, critical thinking, problem solving, decision making, and practical reasoning. Sternberg (Quinby, 1985) indicated that in spite of the terminology used to describe these processes, people are saying the same thing using different words.

Sternberg and Baron (1985) provided a crucial connection between problem solving and critical thinking skills when they described critical thinking skills as including the abilities to "define and clarify, judge information, and infer-solve problems and draw reasonable conclusions" (p. 42) . Ennis' early effort (1962) to define critical thinking or "the correct assessing of statements" (p. 81), also delineated skills that called for the application of formal and informal logic. Ennis has since expanded his concept to include 13 dispositions:

1. Seek a clear statement of the thesis or question.
2. Seek reasons.
3. Try to be well-informed.
4. Use credible sources and mention them.
5. Take into account the total situation.
6. Try to remain relevant to the main point.
7. Keep in mind the original and/or basic concern.
8. Look for alternatives.
9. Be openminded.
10. Take a position (and change position) when the evidence and reasons are sufficient to do so.
11. Seek as much precision as the subject permits.
12. Deal in an orderly manner with the parts of a complex whole.
13. Be sensitive to the feelings, level of knowledge, and degree of sophistication of others (Ennis, 1985, p. 46).

In their historical analysis of problem solving in agricultural education, Lass and Moss (1987) cite Bricker who, in 1916, advocated that "a properly organized course in secondary agriculture must be primarily and fundamentally a series of laboratory and field exercises made up of carefully selected materials, pedagogically and systematically arranged, around which recitations, lectures, and reading will center as supplementary work" (p. 277).

Crunkilton (1984) submitted:

> There is no single teaching technique or approach that will with 100% effectiveness transfer the ability to think and solve problems from one person to another, teacher to student. But, the best foundation discovered to date that captures all of the rudimentary elements of education into one process for developing this reasoning and problem-solving ability in students is through the problem-solving approach to teaching (p. 16).

To apply the principles of problem solving requires a level of competency over and above knowledge of the principles themselves (Ennis, 1980; Norris, 1984). This realization can lead to the conclusion that problem solving is ideally taught within traditional subject matter areas rather than as a separate subject. Can a lack of knowledge in a subject matter area such as agriculture be compensated for by a well-developed set of problem solving skills? Or is knowledge of the subject matter, experience in the area in question, and good judgment essential for the application of problem solving skills to be successful?

Purpose and Objectives

The central purpose of this investigation was to determine the ability of high school agriculture students in Iowa to use problem solving skills. The specific objectives of this study were to:

(1) Assess the problem solving abilities of high school agriculture students in Iowa in terms of selected variables.
(2) Determine if the problem solving abilities of high school agriculture students in Iowa are significantly different from those of two other high school populations.
(3) Determine the amount of variance in problem solving skills that can be explained by selected variables.

Procedures

Population and Sample

The population for this study consisted of 10,603 students enrolled in 262 secondary agriculture programs in the public high schools in Iowa during 1987. Cluster sampling was used because it was not possible to obtain a list of all members of the population. It was determined from Oliver et al. (1983, 1985) that the minimum sample size should be 325 respondents. This sample size was increased by 50% to assure that the cluster sample adequately represented the population. A new minimum sample of 487 respondents was determined to be necessary. The effect size was set at .20 based upon user norms established by Ennis and Millman's work (1985).

The number of schools needed to generate the sample was based upon the statewide average number of students in each program. A computer-generated table of random numbers was used to initially select 25 schools for sampling. Telephone interviews were conducted to ascertain teachers' interest in cooperating in this study and to estimate the number of unduplicated 9th, 10th, 11th, and 12th grade students enrolled in agriculture courses. Eighteen schools were selected for inclusion in the study. One instructor taught in two of the schools. A total of 668 students enrolled in agriculture courses in the 18 schools that participated in the study represented approximately six percent of all high school agriculture students in Iowa. The sampling error was estimated to be 3.8%.

Instrumentation

From a review of the literature, an information sheet was developed to collect demographic information. Six questions on the instrument sought specific information from the respondents: grade level and age, semesters in agriculture classes, years in the FFA, leadership positions held, and the location of their home. A review of the literature failed to yield related research pertinent to these variables. Information available from the Cornell Critical Thinking Tests Level X and Level Z Manual (3rd edition) by Ennis and Millman (1985) established relationships with scholastic aptitude and standardized, subject matter achievement tests. Demographic information for populations previously studied was not available.

The Cornell Critical Thinking Test Level X^R (Ennis and Millman, 1985) is a 71-item multiple-choice test intended to be taken in a 50 minute period. Each item has three choices and one keyed answer. This commercially-prepared instrument was designed primarily for evaluation of critical thinking skills and is aimed at 4th through 14th graders. Reliability estimates for the population studied ranged from .87 to .91. The rationale for selecting this instrument was based on the availability of normative data for the population studied and an extensive review of literature. Aspects that are measured by the instrument include identification of assumptions, induction, deduction, observation statements, and judging credibility.

Data Collection

Agriculture instructors in each of the randomly-selected high schools were sent a letter requesting their participation and cooperation. A package of school-coded test materials was forwarded to each of the 18 schools. Students were administered the Cornell Critical Thinking Test Level X^R during the prescribed 50 minute period of time. Students completed the information sheets during an additional class period. Instructors recorded information from students' cumulative folders to student data sheets. Eight telephone calls were conducted to encourage non-respondent instructors to complete the testing procedures, to verify identification numbers, and to ascertain other missing data. Data collection began in October and ended December 1987.

Analysis of Data

An identification number was assigned to each school and to each respondent to identify the participant by school and individual. Descriptive statistical procedures used included frequencies, percentages, means, and standard deviations computed on all of the items on the information and student data sheets.

A test for significant differences was performed using one-way analysis of variance. A multiple regression analysis was performed to explain problem solving abilities of students. The alpha level was set at .05 for this study.

Results

Descriptive data about the respondents (n=668) are provided in Table 1. The 10th grade class comprised the highest percentage of respondents whereas the lowest percentage of respondents was from the 12th grade class. The largest category of respondents had been enrolled in either one or two semesters of agriculture classes. The smallest category had been enrolled for seven semesters. More than half of the respondents had held one or two high school leadership positions. Slightly more than one-quarter had held three or four leadership positions. Almost three-fourths of the respondents lived on farms. The mean age of the respondents was almost 16 years. The mean number of years respondents had been in the FFA was slightly over three years.

Table 1
Demographic Profile of Respondents

Variable	f		%
Grade			
9	172		25.8
10	187		28.0
11	163		24.4
12	146		21.8
Total	668		100.0
Semesters of agriculture			
1-2	268		40.2
3-4	180		27.1
5-6	142		21.3
7	76		11.4
Total	666		100.0
High school leadership positions			
1-2	223		50.2
3-4	106		23.9
5-6	56		12.6
7 or more	59		13.3
Total	444		100.0
Farm resident	497		74.6
	f	Mean	SD
Age	666	15.9	1.3
Years in FFA	638	3.2	2.1

Listed in Table 2 are means, standard deviations, and the F-ratio for the level of problem solving for the respondents by grade level. The mean score for all respondents was 36.9. The lowest level of problem solving was observed for 10th graders (mean = 34.5) and the highest for 12th graders (mean = 40.6). An analysis of variance revealed significant differences among the four groups. A Scheffe' post hoc test indicated that 12th graders had significantly higher problem solving scores than the other three grades.

Table 2
Problem Solving Means, Standard Deviations, and F-Ratio by Grade in School

Grade	f	M	SD	F-ratio
9	171	36.1	9.4	11.1**
10	187	34.5	10.1	
11	163	37.2	9.6	
12	146	40.6	9.6	
Total	667	36.9	9.9	

**$p < .01$

Means, standard deviations, and percentile scores for respondents' levels of problem solving compared to other high school students are presented in Table 3. Group XP was comprised of students randomly selected from a study hall in an upstate New York suburban school having a high proportion of college-bound students (Ennis and Millman, 1985). Group XQ was comprised of students completing a Biological Sciences Curriculum Study (BSCS) course of study (Ennis and Millman, 1985).

The respondents' mean (36.9) was observed to be the lowest among the three groups. The mean for Group XP was observed to be the highest followed by the mean for Group XQ. The standard deviation (9.9) for Iowa agriculture students was the highest among the comparison groups.

Table 3
Means, Standard Deviations, and Percentile Scores for Levels of Problem Solving Compared to User Norms[a]

Percentile rank	Iowa agriculture students	(XP) high school	(XQ) high school
99	56	57	56
95	52	54	52
85	47	51	49
75	44	50	46
65	42	49	44
50	37	46	41
35	32	44	38
25	29	41	36
15	25	38	32
5	20	32	26
1	15	23	21
f	**668**	**233**	**1673**
M	**36.9**	**45.3**	**40.6**
SD	**9.9**	**6.8**	**7.9**

[a] User norms from Cornell Critical Thinking Tests Level X and Level Z Manual (3rd edition).

Table 4 presents Pearson correlation coefficients showing interrelationships among selected variables, including problem solving. The number of leadership positions held in high school and cumulative grade point average were the only demographic variables that were related to problem solving at a level the author deemed to be of practical significance (r = .25 or higher).

The remaining variables shown in Table 4 are from the Iowa Tests of Educational Development which measure skills in various areas: recognizing the essentials of correct and effective writing (Test E-expression); solving quantitative problems (Test Q-quantitative thinking); critically analyzing discussions of social issues (Test SS-social studies); understanding nontechnical scientific reports and recognizing sound methods of scientific inquiry (Test NS-natural sciences); perceiving the moods and nonliteral meanings of literary materials (Test LI-literature); and using a variety of sources of information (Test SI-sources of information). The Reading Total (RT) score is based on analyses of reading selections from other subtests and the Composite Score (C) represents a total picture of the individual's ability.

Table 4
Interrelationships Among Selected Variables*

	L	GPA	E	Q	SS	NS	LI	SI	RT	C	PS
Leadership (L)	-	.25	.32	.28	.30	.21	.28	.26	.32	.32	.25
Grade Point Average (GPA)		-	.61	.64	.64	.64	.56	.65	.64	.68	.44
ITED Subtests*											
Expression (E)			-	.65	.79	.75	.77	.76	.82	.84	.48
Quantitative Thinking (Q)				-	.74	.74	.64	.74	.74	.80	.44
Social Studies (SS)					-	.85	.84	.84	.93	.93	.51
Natural Sciences (NS)						-	.79	.79	.91	.91	.47
Literature (LI)							-	.76	.92	.88	.51
Sources of Information (SI)								-	.84	.89	.51
Reading Total (RT)									-	.93	.53
Composite Score (C)										-	.53
Problem Solving (PS)											-

*(n = 341; all coefficients $p < .01$); (ITED = Iowa Tests of Educational Development).

The results of a stepwise multiple regression analysis used to explain problem solving scores are presented in Table 5. Four variables entered the regression equation and accounted for 32% of the total problem solving score variance. Although Composite score entered on the first step, it was deleted from the regression model during step 4. Sources of Information individually accounted for almost 29% of the variance. Another subtest from the ITEDs, Test L-Literature, accounted for an additional one percent of the variance. Each of the two remaining variables, cumulative grade point average and number of leadership positions held in high school, accounted for an additional one percent of the critical thinking score variance.

Table 5
Stepwise Multiple Regression of Problem Solving on Selected Variables*

Factor	Multiple R	R^2	R^2 Change	F Change
Composite Score (C)	.53	.28	.27	118.5
Sources of Information (SI)	.54	.29	.01	5.1
Literature (LI)	.55	.30	.01	4.3
Composite Score (C) (Deleted from Model)	.55	.30	-.00	0.5
Leadership (L)	.56	.31	.01	5.7
Grade Point Average (GPA)	.57	.32	.01	4.7

*For the Model: F = 36.1 (4, 336); only factors explaining significant amount of variance ($p < .05$) included in Model.

Discussion

The problem solving mean score for all of the Iowa agriculture students (36.9) indicated that the respondents answered correctly approximately 56% of the questions. The mean for the 10th grade respondents was the lowest of the four grades. The highest standard deviation for problem solving for all grade levels was noted for this same group. Significant differences were observed among the mean problem solving score of the 12th grade respondents and the respondents in each of the other three grade levels.

When compared to the other two high school groups, the agriculture students had comparable problem solving scores through the upper third of the percentile rankings. However, a disparity in problem solving scores appeared at the 50th percentile and rapidly increased thereafter. There was considerable variation in the individual levels of problem solving of the students studied in this investigation.

The deletion of the Composite Score in the 4th step of the multiple regression might be explained by the fact that the Composite Score is derived from scores of the other subtests of the ITED. Sources of Information evaluates a student's ability to utilize sources of information and to judge the appropriateness of various sources when specific information is required. Specifically, these skills include comprehension, interpretation, analysis, evaluation, and generalization.

Intuitively it might be thought that the factors associated with maturation, i.e. age, grade level, semesters of agriculture, or years in FFA, would have some bearing on the problem solving scores. However, these variables were of limited importance to problem solving. The demographic variables that mattered most were cumulative grade point average and the number of leadership positions a student had held in high school.

Conclusions and Recommendations

The levels of problem solving observed for the respondents indicate that some level of proficiency is indeed present. However, much variability exists in the proficiency levels for the respondents. A cursory observation may lead one to initially conclude that the mean level of problem solving observed in the sample of predominantly rural high school agriculture students in Iowa is lower than that of the two comparison groups used in this investigation. An extensive review of the problem solving literature did not reveal investigations that focused on the group examined in this study. Thus, the findings of this study can serve as a foundation to compare and contrast other agriculture students through a replication of this study.

Imminent authorities in the fields of education and cognitive psychology have not prescribed quantitative or benchmark criteria from which to base judgments about desirable levels of problem solving. The nature of problem solving currently precludes anything more tangible than a curriculum based upon a conceptual model of desirable cognitive skills that research has shown to increase the problem solving abilities of students.

In this regard, curriculum and other instructional materials have been designed, produced, and tested that can increase student levels of problem solving. Research has shown that incorporating problem solving concepts into a curriculum is more effective than a distinctly separate problem solving course to improve a student's ability to solve problems.

The concepts to teach problem solving skills should be infused into the agriculture curriculum. Teacher educators should develop instructional materials for use by agriculture instructors which will facilitate instruction in problem solving. Instructors may become more effective if strategies are developed to assist students in developing problem solving skills. High school agriculture students should have more than some vaguely defined minimum level of competency in problem solving to function efficiently.

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AGRICULTURE STUDENTS AND THEIR PROBLEMS SOLVING SKILLS

A Critique Prepared by Arthur L. Berkey, Cornell University

This study addresses higher level cognitive skill development in terms of problem solving ability. This topic is consistent with current educational emphasis on teaching transferable processes as compared to specific subject matter content. The study is related to the other research reported in this session by Professor Rollins. Although applicable, the strengths, comments and questions on methodology mentioned for that study will not be repeated here.

Strengths of the study include the significance of the topic, appropriateness of the statistics used to meet the objectives of the study, the data supporting the findings and conclusions, and the use of standardized instruments for which reliability and validity have already been determined.

Questions and comments center on the selection of the two comparison XQ and XP groups, and the scope of the conclusions and recommendations. The two other groups are different from the Iowa study respondents and the procedures for selection are not included in the population and sample sections. Use of the two groups from one New York school does limit the study and should be stated as such. Mean IQ scores for the groups would seem to be another relevant independent variable for the groups. As in the companion study, the conclusions and recommendations section needs to be expanded to include the implications for change by classroom teachers. It would also have been helpful to know the extent to which problem solving as a teaching strategy was used in the classes taken by the three groups. Cognitive ability and experience with use of problem solving would intuitively seem to be the variables associated with problem solving ability. Another question is if a problem solving exercise as a data input would have established a firmer link between the tests given and problem solving ability.

In summary, the research address a very important research area that will become increasingly important with acceleration of the knowledge explosion where the teacher by necessity becomes a manager rather than a source of knowledge.

AGRICULTURE STUDENTS' PREFERRED STYLES OF LEARNING

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In their efforts to help students develop skills and master knowledge, vocational agriculture instructors are challenged by students with a wide variety of learning styles. Do we change the learning environment? Do we change the way our students learn? Or do we change the educational delivery system?

Human beings differ from one another in a vast number of ways. The demands of a particular situation draw upon aptitudes that create individual differences in the person's response to the problem. A student's performance in eduction is a product of whatever mixture of predispositions he/she brings to that performance that interact with the educational tasks and situations presented. Perkins (1985) alluded to some of these predispositions when he stated:

> It has often been suggested that intellectual competence depends on an individual's cognitive style, meaning various slow-changing characteristics that pervade a person's manner of thought and perception. . . . Such characteristics differ from strategies, as the term is used here, in that strategies are specific actions to be taken at specific points in a problem solving or other process. Indeed, the distinction between strategies and cognitive style is not always made. However, I want to urge that the distinction is worth making. Because strategies occur at particular points within an ongoing process, whereas cognitive-stylistic characteristics pervade the process, the dynamics of learning one or the other might be quite different. Also, which one or what synthesis best accounts for intellectual competence is an important question (p. 350).

A learning style consists of combinations of cognitive, affective, and physiological traits. Collectively, these traits are used to characterize how learners typically learn best. Learning style reflects individual differences in the way information is acquired, processed, and assimilated. Learning styles encompass four aspects of an individual's psychological makeup: 1) cognitive styles or information processing habits, 2) patterns of attitudes and interest, 3) compatible dispositions to one's cognitive style, and 4) dispositions to use or not use certain learning tools (Lawrence, 1984).

Studies of learning style suggest that individuals tend to place themselves in and seek out situations and tasks which will allow them to use their preferred modes of bringing new information into their cognitive structures. Knowledge about learning styles is a fundamental new tool at the service of teachers and schools. It provides a deeper, more profound view of the learner than previously perceived, and is part of the basic framework upon which a sounder theory and practice of thinking, learning, and instruction may be built. As agricultural educators, we need to account for individual differences among learners to optimize learning experiences in agriculture programs.

Purpose and Objectives

The primary purpose of this study was to examine the learning styles and individual preferences of Iowa agriculture students for learning activities while in an agriculture course. The specific objectives of this study were to:

(1) Determine the learning styles of Iowa agriculture students.

(2) Analyze learning activities associated with learning style.

Procedures

Population and Sample

The population for this study consisted of 10,603 students enrolled in 262 secondary agriculture programs in the public high schools in Iowa during 1987. Cluster sampling was used because it was not possible to obtain a list of all members of the population. It was determined from Oliver et al. (1983, 1985) that the minimum sample size should be 325 respondents. This sample size was increased by 50% to assure that the cluster sample adequately represented the population. A new minimum sample of 487 respondents was determined to be necessary. The effect size was set at .20 based upon user norms established by Ennis and Millman (1985).

The number of schools needed to generate the sample was based upon the statewide average number of students in each program. A computer-generated table of random numbers was used to initially select 25 schools for sampling. Telephone interviews were conducted to ascertain teachers' interest in cooperating in this study and to estimate the number of unduplicated 9th, 10th, 11th, and 12th grade students enrolled in agriculture courses. Eighteen schools were selected for inclusion in the study. One instructor taught in two of the schools. A total of 668 students enrolled in agriculture courses in the 18 schools that participated in the study represented approximately six percent of all high school agriculture students in Iowa. The sampling error was estimated to be 3.8%.

Instrumentation

From a review of the literature, an information sheet was developed to collect demographic information as well as individual student preference data on how they learn in an agriculture course. Six items on the instrument sought specific information from the respondents: grade level, age, semesters in agriculture classes, years in the FFA, leadership positions held, and the location of their home. Extensive reviews of the literature failed to yield related research pertinent to these variables. Nineteen questions were formulated from a review of literature to provide a profile of how students prefer to learn. The respondents were asked to indicate their preference for learning through various classroom teaching activities.

The Myers-Briggs Type Indicator^{TM} (MBTI) Form G (Briggs & Myers, 1977) was administered to all respondent to determine their learning style. The MBTI was used because of its application to various populations. It has also been used extensively in research dealing with personalities and learning styles of high school students. The MBTI identifies four individual preferences or strengths that persons use in gathering information and making decisions. Using four of the eight factors, a person's learning style is derived from a possible combination of sixteen types. The MBTI has a test-retest reliability of .87.

The Myers-Briggs Type Indicator^{TM} contains four separate indices which reflect one of four basic preferences directing the use of an individual's perception and judgment. The four preferences are: Extraversion or Introversion (E or I); Sensing perception or Intuition perception (S or N); Thinking judgment or Feeling judgment (T or F); and Judgment or Perception (J or P). The Sensing (--S-) and Intuition (--N-) preference reveals basic learning styles differences. The MBTI provides information about the ways learners prefer to perceive meaning (sensing vs. intuition--a cognitive dimension), to express values and commitment (thinking vs. feeling), and to interact with the world (extraversion vs. introversion) (Keefe, 1982).

Data Collection

Agriculture instructors in each of the randomly selected high schools were sent a letter requesting their participation and cooperation in the study. A package of school-coded test materials was forwarded to each of the 18 schools participating in the study. Students were administered the Myers-Briggs Type Indicator^{TM} (MBTI) Form G (Briggs & Myers, 1977) during the length of the class period. Students completed the information sheets during an additional class period. Instructors recorded information from students' cumulative folders to student data sheets. Eight telephone calls were conducted to encourage non respondent instructors to complete the testing procedures, to verify identification numbers, and to ascertain other missing data. Data collection began in October and was completed in December 1987.

Analysis of Data

An identification number was assigned to each school and to each respondent to identify the participant by school and individual. Descriptive statistical procedures used included frequencies, percentages, means, and standard deviations computed on all of the items on the information and student data sheets. Spearman rho coefficients were used to determine whether two groups agreed on the rank order selected for learning activities examined in this study. The .05 alpha level was used in the study.

Findings

Descriptive data about the respondents (n=668) are provided in Table 1. The 10th grade class comprised the highest percentage of respondents whereas the lowest percentage was from the 12th grade class. The largest category of respondents had been enrolled in either one or two semesters of agriculture classes. The smallest category had been enrolled for seven or more semesters. More than half of the respondents had held one or two high school leadership positions. Slightly more than one-quarter had held three or four leadership positions. Almost three-fourths of the respondents lived on farms. The mean age of the respondents was almost 16 years. The mean number of years respondents had been in the FFA was slightly over three years.

Table 2 contains the means, standard deviations, and rankings of 19 learning activities by Iowa agriculture students. The students were asked to rate on a scale from 1 to 99 their preferences for the 19 activities while learning in an agriculture course. A score of 1 indicated "no preference", 50 "some preference", and 99 "very much preference."

Learning "in laboratories and shop activities" had the highest mean and was "much preferred" by the students. The mean for this activity was almost 10 points higher than the mean of the next highest-ranked learning activity, "working on group projects with classmates." "Following my own impulses and being flexible" had the third highest mean and was less than one point lower than the students' second choice of learning activities. "Learning by formalized instruction (lectures, teacher assignments, homework) was of "little preference" to the students. This preference was ranked 18th and next to last. The lowest-ranked learning preference by a wide margin was when students had to "memorize facts."

Table 3 contains the rankings of 15 learning activities by students with Intuitive or Sensing learning styles as determined by the MBTI. The MBTI provides information about ways learners prefer to perceive meaning (sensing vs. intuition). The Sensing (--S-) and Intuition (--N-) preference reveals learning style differences.

Table 1
Demographic Profile of Respondents

Variable	f		%
Grade			
9	172		25.8
10	187		28.0
11	163		24.4
12	146		21.8
Total	668		100.0
Semesters of agriculture			
1-2	268		40.2
3-4	180		27.1
5-6	142		21.3
7	76		11.4
Total	666		100.0
High school leadership positions			
1-2	223		50.2
3-4	106		23.9
5-6	56		12.6
7 or more	59		13.3
Total	444		100.0
Farm resident	497		74.6
	f	Mean	SD
Age	666	15.9	1.3
Years in FFA	638	3.2	2.1

According to Myers and Briggs (Lawrence, 1986), 70% of secondary students prefer the Sensing learning style. In this study, 68% of the agriculture students preferred the Sensing learning style and the remainder (32%) the Intuitive learning style.

When the respondents were asked to rank their preference for activities "while learning in an agriculture course," their rankings were not always consistent with their preference for a learning style. The means of the Intuitive and Sensing learning style groups for their preference of learning "in laboratories and shop activities" were almost identical and was rated highest by both groups. According to Myers and Briggs, this learning activity should be more highly associated with the Sensing learning style than with the Intuitive style.

This anomaly also held true for "working on group projects with classmates," "observing specific things and activities," "from demonstrations in class," and other learning activities as well. "By memorizing facts" was ranked last by the students with either Intuitive or Sensing learning styles. According to Myers and Briggs, this learning activity should be closely associated with the Sensing learning style. A Spearman rho coefficient of .90 indicated that students with the Intuitive or Sensing learning styles preferred the 15 learning activities to the same degree. This finding does not follow the Myers-Briggs theory.

Table 2

Means, Standard Deviations, and Ranking of 19 Learning Activities by the Respondents

Learning Activity "In an agriculture course, I prefer to learn:":	Mean	S.D.	Rank
In laboratories and shop activities.	76.0	23.9	1
Working on group projects with classmates.	67.6	24.3	2
By following my own impulses and being flexible.	66.9	25.1	3
By being creative and original.	63.8	26.1	4
When someone takes a personal interest and involvement in me.	61.4	27.9	5
Observing specific things and activities.	60.6	24.7	6
From demonstrations in class.	60.1	26.6	7
Using audiovisual materials (films, slides, TV, etc.).	60.0	26.6	8
In discussion groups with my classmates.	59.9	26.8	9
When I can use a computer.	57.3	30.6	10
By thinking and reasoning by myself.	57.3	28.6	11
From personal relationships.	57.0	26.6	12
When material is presented logically and orderly.	56.9	27.2	13
Through independent study.	43.4	28.0	14
From topics selected by other students.	41.8	26.7	15
By reading books and teaching myself things.	39.5	29.8	16
Giving reports on topics interesting to me.	39.4	31.8	17
By formalized instruction (lectures, teacher assignments, homework).	34.2	28.4	18
By memorizing facts.	28.2	26.1	19

Table 3

Rankings of 15 Learning Activities by Students with Intuitive or Sensing Learning Styles[a]

Learning Activity	**Intuitive** N=210			**Sensing** N=456		
"In an agriculture course, I prefer to learn:"	Mean	SD	Rank[b]	Mean	SD	Rank[b]
In laboratories and shop activities.	75.4	23.9	1	76.1	24.3	1
By being creative and original.	68.3	26.5	2	61.7	25.7	4
Working on group projects with classmates.	67.3	24.8	3	67.9	24.0	2
When I can use a computer.	52.4	29.3	4	54.7	31.0	9
Observing specific things and activities.	59.3	24.9	5	61.4	24.6	5
When someone takes a personal interest and involvement in me.	59.1	29.2	6	62.6	27.2	3
From demonstrations in class.	58.8	28.0	7	60.7	25.9	6
From personal relationships.	57.7	26.7	8	56.9	26.6	7
When material is presented logically and orderly.	56.9	27.5	9	56.6	27.1	8
By reading books and teaching myself things.	43.9	31.8	10	37.3	28.6	13
Through independent study.	43.5	30.8	11	42.9	26.8	10
From topics selected by other students.	39.2	27.3	12	42.8	26.4	11
Giving reports on topics interesting to me.	37.6	32.7	13	40.0	31.3	12
By formalized instruction (lectures, teacher assignments, homework).	30.6	28.1	14	35.6	28.4	14
By memorizing facts.	24.9	25.4	15	29.2	26.3	15

[a]-Only 15 of the original 19 learning activities were correlated with the Intuitive-Sensing learning styles identified by the MBTI.

[b]-Spearman rho correlation coefficient = .90; _df_ = 13; _p_ < .01.

Table 4 reveals the rankings of 7 learning activities by students classified by the MBTI as Extroverts or Introverts. The extraversion-introversion preference shows the broad areas of students' natural interests. This pair of preferences refers to habitual, not consistent, tendencies. Within the school population, the expected distribution of Extroverts to Introverts is approximately 70%-30%. The ratio of Extroverts to Introverts in this study was 58%-42%.

Table 4

Rankings of 7 Learning Activities by Students Classified as Extroverts or Introverts[a]

Learning Activity	Extroverts N=384			Introverts N=283		
"In an agriculture course, I prefer to learn:"	Mean	SD	Rank[b]	Mean	SD	Rank[b]
Working on group projects with classmates.	70.5	23.8	1	64.0	24.5	1
By being creative and original.	65.3	26.2	2	61.7	26.0	2
In discussion groups with my classmates.	63.0	26.4	3	56.4	26.7	4.5
By thinking and reasoning by myself.	58.8	41.7	4	55.6	29.4	6
When material is presented logically and orderly.	56.9	27.5	5.5	56.4	26.9	4.5
When I can use a computer.	56.9	30.6	5.5	57.5	30.9	3
Giving reports on topics interesting to me.	40.4	32.0	7	37.7	31.4	7

[a]-Only 7 of the original 19 learning activities were correlated with the Extrovert-Introvert learning styles identified by the MBTI.

[b]-Spearman rho correlation coefficient = .76 ; $df = 5$; $p < .01$

Extroverts and Introverts tended to prefer the same types of learning activities. Both groups ranked "working on group projects with classmates" and "by being creative and original" as their two most-preferred learning activities. "Giving reports on topics interesting to me" was the least preferred of the seven learning activities. According to Myers' and Briggs' theory, all three of these learning activities should be associated with the extroversion learning style. A Spearman rho coefficient of .76 revealed that students with the Extroverted or Introverted learning styles were in agreement of their preferences for the 7 learning activities. This finding does not follow the Myers-Briggs theory.

Discussion

The results of this study confirm the findings of Myers and Briggs (Lawrence, 1986) that 70% of secondary students prefer the Sensing (-S--) learning style. Individuals preferring this learning style rely on experience rather than theory, trust the conventional way of doing things, and prefer to begin from what is known and real, and then move step by step tying each new fact to past experience. Such individuals then test for relevance in practical use. Learners preferring the Sensing learning style who are Extroverts need to know "why" before doing something and like group projects, class reports, and team competition. Introverts who prefer the Sensing learning style, on the other hand, like lectures and enjoy working alone.

The 15 learning activities preferred by students with the Sensing or Intuitive learning styles revealed a high degree of agreement. Similar results were obtained when 7 of the learning activities were ranked by students classified as Extroverts or Introverts.

The majority of respondents, including those who favored the Sensing learning style, also preferred to learn through a variety of instructional techniques that are unique to agricultural subject matter--team competition, group projects, and hands-on experiences. They overwhelmingly preferred interactive and experiential learning activities. The more conventional instructional techniques met with much disfavor among the agriculture students.

Conclusions and Recommendations

Most agriculture students in this study preferred a Sensing (-S--) learning style. When this preference is translated into learning activities, students need to move step-by-step through a new experience with their senses as fully engaged as possible. They thrive on established routines, work steadily and patiently and are interested in facts and details. They will seldom use their imagination and prefer memorizing to finding reasons. They overwhelmingly prefer experiential and activity-oriented instruction. These students prefer doing something with tangible objects rather than listening to what someone is saying unless it concerns an action or adds something definite to their picture of the physical world.

Appropriate instructional techniques for educators to use with such students could include sequential laboratory exercises and experiments; group discussion and projects; team competition; brain-storming activities; demonstrations; and short, activity-oriented exercises that provide new skills.

It may be helpful to replicate this study to determine if the sample of agriculture students are truly representative of the.larger population used by Myers and Briggs. Regardless of the student's preferred learning style, he/she seem to prefer similar learning activities. Based upon the findings of this study, instructors of agriculture students need to insure that instructional techniques reflect perhaps the preferred learning activities rather than the learning styles of their students.

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AGRICULTURE STUDENTS' PREFERRED STYLES OF LEARNING

A Critique Prepared by Arthur L. Berkey, Cornell University

Adding to the knowledge base on teaching and learning is the major rationale for research in education. This descriptive study contributes by addressing the area of learning styles.

The study had a number of strengths. The introductory information did introduce the topic and indicated the literature had been reviewed. The cluster sample was carefully selected. An existing standardized instrument with a high reliability and an established validity was used. The response rate appeared to be 100%. The findings were supported by the data. The large number of respondents makes this essentially a longitudinal study with implications for additional research.

Comments and questions regarding the study are as follows. It would have been helpful to know how the number of schools was reduced from the 25 initially selected to the 18 used. A 100% student response rate is inferred. Unless the data was collected over a period of time one would have to assume no absences for agriculture students in 18 schools. Would it have been possible to select different student background variables such as personality types or GPA in cognitively oriented classes that the literature does indicate to be related to learning styles? I note that the objectives of the study do not address collection or analysis for the background information. The purpose of the study would have been strengthened by including the "so what" or how the results of the study could be anticipated to be used to enhance student learning. Using a scale of 01-99 is broader than the usual seven point range that the literature indicates is the maximum for student discrimination. The likert scale modifies this somewhat, however. Assigning values to the likert scale terms is a more usual procedure. A basic assumption of the research not stated for the study is that the variable of teaching style is either constant, or not a relevant independent variable, across the 18 schools. Some data on instructors would have enhanced the study. The comparative analyses were limited between activity groupings and learning styles. Finally, the conclusions/recommendations/implications section is limited given the data from the study. For example, no conclusion is listed for the finding of differences between the study results and the Myers-Briggs theory. The importance of the feasibility/desirability of determining the learning styles of learning activities for the 30% of students not preferring the sensory style could be mentioned.

In summary, the study addresses an important area in teaching and learning. It provides data from a large population of students and has direct relevance for agricultural instruction at the classroom level.

IDENTIFICATION OF CURRICULAR STRATEGIES FOR ENHANCING UNDERGRADUATE EXPERIENCES IN COLLEGES OF AGRICULTURE

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Introduction

Higher education in America is facing numerous problems (enrollment, costs, quality of programs, etc.) as we venture towards the year 2000 (Boyer 1987). In particular, post secondary curriculum design and content have become critical issues and their importance is magnified if one accepts the belief each student is directly influenced by the curriculum. Initially, curriculum was thought to be a broad course of studies including: grammar, literature, writing, math, science, history and foreign languages. These notions were broadened to encompass all the experiences that students encountered under the guidance of their teachers. During the era of the 60s, curriculum thinking changed, increasingly focusing on the methodology of individualized instruction. A basic premise of curriculum in the 60s was that students should be responsible for planning their own curriculum. Subsequently, educators have come to define the postsecondary curriculum as a plan consisting of academic and interpersonal activities directed toward the attainment of educational and employment goals (Anderson 1965).

The postsecondary curriculum should be reflective of the mission set forth by the institution, college and/or academic unit. When the curriculum and the mission are in congruence, educational goals should be more readily attainable. Appropriate educational goals for postsecondary institutions include: (1) the transmission of learning, (2) the expansion of knowledge, and (3) the dissemination of the results to the public. In short, the mission of higher education in land grant institutions should be about TEACHING, RESEARCHING, AND SERVICING. Such a mission requires that active collaboration between persons and organizations in both the academic and non-academic community. The curriculum, an extension of the land grant institution's mission, is therefore directly tied to both the academic and non-academic communities. The mission and ultimately the curriculum of the institution and college is influenced by its overall reputation in both the academic and non-academic communities, traditions, interest of the faculty and campus intellectual climate. To plan a relevant curriculum for the future, systematic efforts must be taken to identify curricula strategies needed to develop an educated person who can effectively make the transition from the academic to the non-academic environment.

Need for the Study

The Joint Council on Food and Agriculture (1985) indicated that one of the major challenges to the United States is to provide the needed food, fiber and forest products for both domestic and international markets. The U.S. is a world leader in agriculture technology and to maintain that position, colleges of agriculture must be responsible and accountable for attracting and developing future agricultural scientists. The development of agricultural scientists requires college curricula which bridge the gap between academic institutions and industry needs. Boyer (1987) in describing the total undergraduate experience concluded there is a "disturbing" gap between college and the larger world. As we think of an appropriate curriculum, we must consider the linkage between what is learned within educational institutions and the method of acquisition and application in the larger society.

Agricultural issues are compellingly important in a world society of increasing imbalances between the human population and the resource base that sustains it. Testimony provided at the hearings of the Committee on Agriculture (1984) substantiated the need to formulate agricultural curricula models that embrace a combination of observations and practical work experiences which reinforce the student's academic studies. Such curricula should aid students in developing a greater understanding of their connection to the environmental resources around them and making application to their work environment. In a classroom, issues and content are usually defined by the academic discipline or the research interest of the faculty, but in the real world the boundaries of individual disciplines cannot be readily distinguished. Most issues in agriculture industry and business are multifaceted and seldom solved with unidimensional solutions. For example, if you were discussing the limits of our natural resources you have to consider such areas as economics, governmental policies, social structure and ecology. This illustrates the need for a curriculum which considers issues from a holistic approach. Block (cited in Naughton and Wilson 1985), former U.S. Secretary of Agriculture stated:

> Viability of the food and agricultural industry relies heavily on our ability to attract outstanding minds: the development of human resources will have as great an impact on the future of an increasingly high technology agriculture as any single factor. Graduates of the future must be prepared to deal with the technical, social, political and economic issues. Modern colleges of agriculture must bridge all of the gaps between the farming enterprise, agribusiness and the most basic research opportunities. (p. 34)

Block called for a greater emphasis on an interdisciplinary curricula approach in colleges of agriculture. To respond to this challenge, we must reevaluate the content of the curricula and the manner in which we deliver such curricula. This is not an issue unique to agriculture but is common across the total undergraduate curriculum (Stark and Lowther 1988).

Purpose of the Study

This study focused on curriculum content and delivery concerns which need to be addressed in order to enhance the undergraduate experiences in colleges of agriculture. The overall purpose of this descriptive Delphi study was to identify curriculum strategies essential for helping future agriculture graduates effectively make the transition between the academic environment of higher education institutions and the practicalities of the non-academic world.

Objectives of the Study

The objectives of this study were twofold. They were:

1. To identify a hierarchical framework of needed agricultural curricula content strategies needed to bridge the gap between the academic institutions and the non-academic community.

2. To identify curriculum delivery/methodology strategies to assist students in bridging the gap between the academic institutions and the non-academic community.

Sample

The sample consisted of 48 faculty members from colleges of agriculture, or their equivalent, located throughout the United States. The study's participants represented two types of institutions: (1) The National Association of State Universities and Land Grant Colleges (NASULGC), both 1860 and 1890 colleges and universities, and (2) The American Association of State Colleges of Agriculture and Renewable Resources (AASCARR) institutions. The sample was selected with the assistance of Dr. James Mortensen, Associate Dean for Resident Education, The Pennsylvania State University and doctoral committee members. Input from deans and administrators of resident education throughout the United States was obtained in the selection of the faculty sample. The select stratified sample included educators from each of the four geographical Agricultural RICOP areas. Procedures used in identifying the faculty sample were:

1. Deans and administrators from colleges of agriculture were contacted to identify key faculty in their institutions who may participate in the project.
2. Telephone calls were made to each of the suggested faculty to describe the project and solicit their participation.
3. A follow-up, confirmation letter was sent to all participants

Criteria used to select the sample were that faculty were perceived by their Deans and/or administrators as (a) knowledgeable in their field of study, (b) futuristic in their thinking, (c) having a good understanding of undergraduate resident instruction, (d) interested in future curricula changes, and (e) willing to participate in the study.

Design of the Study

This descriptive study utilized a modified Delphi technique to generate a list of agricultural curriculum and delivery strategies to enhance the undergraduate experience in agriculture. The Delphi was appropriate in this study because the author wanted to collect original data from the sample. The Delphi technique is a way of structuring and administrating questionnaires to organize and shape opinions through the use of sequenced and interactive feedback. This Delphi study was structured to collect original data by administering an initial open-ended questionnaire. The information from the original questionnaire was used to develop the second questionnaire. The Delphi technique results in the subsequent questionnaire being a refinement of results from the preceding questionnaire. A summary of each questionnaire, its contents, and what the sample was asked to do is shown below:

Questionnaire Number	Contents	Sampled asked to:
Q1	Open-ended questionnaire requesting curriculum content and delivery/methodology changes necessary to deliver curricula for the year 2000 and beyond.	Generate statements of curriculum strategies to assist in bridging the gap between the theory of the academic world and the practicalities of the work world.

Q2	Consolidated list of 128 responses generated from Q1.	Rank curricula strategies items using a Likert-type scale from 1 to 4 to indicate a rating of strongly agree, agree, disagree, strongly disagree or no opinion.
Q3	Pooled list of the top responses generated in Q2 with a calculated means rating between 1.0 and 1.8.	Review the calculated mean and curricula strategies generated from Q2. They were asked to rank the item in order of importance.

In utilizing the Delphi technique, procedures were formulated with the following concerns in mind:

1. What question can be used to generate a broad range of input on the first questionnaire?
2. What is the best method to utilize the original data collected from Q1 to construct the second questionnaire?
3. What measure of central tendency should be used to indicate consensus on the third questionnaire?

Statistical Analysis

The final result of the study was a hierarchical list of needed curricula content and delivery/methodology changes as perceived by a national panel of agriculture faculty. The mean item score and standard deviation were calculated for each strategy using the Statistical Package for the Social Sciences, Version 10(SPSS^{x}). The mean item scores were calculated to determine the rating and ranking of all change strategies within the content and delivery/methodology categories. The standard deviations were calculated to determine the level of consensus among the respondents.

Findings

This study identified a hierarchical listing of content and delivery/methodology strategies perceived by a nationwide sample of agriculture faculty to be important in enhancing undergraduate education in colleges of agriculture. Questionnaire one resulted in the identification of 128 change strategies; 57 in the content area and 71 in the delivery/methodology area. The change strategies were grouped within 11 major areas: communication, international/global understanding, managerial skills, ethics, general university core courses, agricultural core courses, computer delivery, technology delivery, practical experiences, educational utility systems and general delivery.

In questionnaire two, respondents were asked to respond to each strategy as (1) strongly agree, (2) agree, (3) disagree, and (4) disagree. A mean rating was calculated for each item. Those change strategies with a mean rating between 1.0 and 1.8 were identified as the major strategies and were used in questionnaire three. Results from questionnaire two resulted in a list of 22 items to be ranked by the respondents in questionnaire three. There were in 14 strategies related to content and 8 strategies related to delivery/methodology. The change strategies to be rated were:

CONTENT CHANGES

Faculty should increase opportunities in writing.
Faculty should increase opportunities in speaking.
Faculty should increase students' skills in integrative problem solving thinking.
Faculty should increase students' skills in decision making.
Faculty should help students become more aware of the impact of agricultural practices in the environment.
Faculty should enhance students' knowledge of global agriculture.
Faculty should increase students' skills in interpersonal and human relations.
Faculty should increase opportunities in listening.
Faculty should increase students' knowledge in leadership training.
Faculty should enhance students' knowledge of world geography.
Faculty should increase students' skills in information retrieval and management.
Faculty should enhance students' knowledge of international trade.
Faculty should help students become more aware of moral values.

DELIVERY/METHODOLOGY CHANGES

Faculty should increase use of teaching through problem-solving.
Faculty increase the use of writing exercises to initiate thought.
Faculty should deliver content through accessing computers.
Faculty should increase the use of oral student presentations.
Faculty should deliver content through spread sheets.
Faculty should increase the use of computer simulations.
Faculty should provide students with hands on experiences.
Faculty should increase the use of case studies.

Questionnaire three was designed to identify the top priorities for the change strategies developed as a result of questionnaire two. Respondents were asked to rank content strategies in order of priority. 1 being highest priority and 14 being lowest priority. In delivery/methodology strategies, 1 was the highest and 8 was the lowest priority. Findings for the top five priorities for content and delivery/methodology changes are presented below. The five major curricular content strategies identified were:

Content	Means	SD
Faculty should increase students' skills in critical thinking.	2.90	1.90
Faculty should increase students' skills in integrative problem solving.	2.92	2.44
Faculty should increase students' skills in decision making.	4.16	2.66
Faculty should increase opportunities in writing.	4.53	2.03
Faculty should increase opportunities in speaking.	5.56	2.66

The five major delivery/methodology strategies identified were:

Delivery/Methodology	Means	SD
Faculty should increase use of teaching through problem-solving.	1.61	1.05
Faculty should increase the use of writing exercises to initiate thought.	2.87	1.51
Faculty should provide students with hands on experiences.	3.18	1.44
Faculty should increase the use of oral student presentations.	4.63	1.55
Faculty should increase the use of case studies.	4.74	2.05

Several items surfaced as important but were not high enough to be identified as a top strategy. Among those items were international economics, international politics, cross cultural studies, computer technology, and agribusiness. It should be noted that these items were rated high enough to be given serious consideration for inclusion in agricultural curricula.

Discussion and Summary

We are on the threshold of a new postsecondary educational revolution. National studies such as the Holmes Report, the Association of American College's Integrity in the College Curriculum. and A Nation at Risk have contributed to a silent revolution in many institutions of higher education. There is constant examination and evaluation of an institution's research output, the success of its students and the institution's national reputation. These activities have all contributed to creating an atmosphere of change. A starting point for such change is with the curricula content and delivery/methodology. Cleveland (cited in Marchello, 1987) proposed five educational elements for such change to take place:

> Education is integrative brain work to develop the capacity to synthesize for problem solving using the analytical methods and insights of conventional academic disciplines.
>
> Education is about the social goals, public purposes, costs, benefits and ethics of citizenship to enable a person to judge the course of their actions.
>
> A capacity for self-analysis and identity through the study of heritage, religion, philosophy, art, and literature.
>
> Some practice in real-world negotiation, in the psychology of consultation and the nature of leadership in the knowledge environment.
>
> A global perspective and an attitude of personal responsibility for the general outcome of public life.

Cleveland's elements for change capture the generic strategies identified by the study respondents.

This study has provided additional information concerning content and delivery/methodology change strategies as it relates to enhancing undergraduate programs in colleges of agriculture. The priorities that surfaced as a result of this study are directly related to skills in information management, communication and practical experiences. This information concurred with other studies such as Broder and Houston (1986), Gunn (1986), Coorts (1987), and Gamon (1988).

Many of the issues confronting agricultural educators were identified on the fringes of important by the participants, but not rated high enough to be considered in this study. Strategies of concern are those items included in international/global understanding, leadership training, computer usage and technological delivery. These strategies will be key characters in the information age, and we must make room for them in our curricula.

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IDENTIFICATION OF CURRICULAR STRATEGIES FOR ENHANCING UNDERGRADUATE EXPERIENCES IN COLLEGE OF AGRICULTURE

A Critique Prepared by David L. Howell, University of New Hampshire

The authors did an excellent job in pointing up the needs for this study. Enrollments, costs, and quality of programs are a real concern in Colleges of Agriculture in the U.S. as pointed out by these authors. This study looks at one of the three missions of land grant institutions which is teaching. The emphasis on an interdisciplinary curricula approach within colleges of agriculture is very important. Students need to see the relationship between courses and how they all fit together.

The objectives of the study were clearly stated. Using a descriptive design incorporating the Delphi technique was appropriate for the objectives.

The study stated that the sample consisted of 48 faculty members from Colleges of Agriculture throughout the U.S. identified by deans and administrators of resident education. Nothing was said however concerning the size of the target population or the non-respondents. Given the criteria used for selection is the reader to assume there were only 48 faculty members in the U.S. who meet the criteria or that they all responded? A related question deals with the identification of discipline areas represented by the respondents and their teaching responsibilities. This would be helpful in determining to whom these results can be generalized.

The design of the study was explained very well. The findings point to content areas that many universities have been concerned with. The University of New Hampshire is currently including most of those content changes in the general education courses. We in Colleges of Agriculture must review our other courses to see that they include these content changes as well.

Today's agriculture student is different from 20 or even 10 years ago. Most do not have an agricultural background to draw upon. This study identifies ways that we can change our curriculum content and delivery/methodology strategies to better meet the needs of our students and the agricultural community. The authors are to be congratulated for conducting such a timely and important study.

IDENTIFICATION OF TEACHING TECHNIQUES, STRATEGIES AND STYLES FOR USE WITH SPECIAL NEEDS STUDENTS ENROLLED IN VOCATIONAL AGRICULTURE

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Introduction

Vocational education for special needs students has had legislative and philosophical support since the passage of the Vocational Education Act of 1963 as amended in 1968. Further support came with the page of the "Education For All Handicapped Children Act" (P.L. 94-142) in 1975. This law required that local public school districts locate and identify all handicapped children in need of special education and related services and to provide those services as guaranteed by the law. The Carl D. Perkins Act of 1984 (P.L. 98-524) provided for vocational education services and activities designed to meet the special needs of handicapped and disadvantaged students.

From data reported by Baggett, Scanlon, and Curtis (1985), five out of every six vocational agriculture programs in Pennsylvania have at least one handicapped student enrolled, with one of every six programs reporting ten or more handicapped students enrolled. Their study also reported eight common problems faced by educators in dealing with mainstreamed students. The highest ranked problems were indicated to be class size, curriculum modification and lack of training. As indicated by the researchers, this reinforced the findings of Hughes (1978) and Manzitti, Boratynski and Rader (1976) who stated that lack of teaching methods and curriculum modification were the most severe problems encountered by regular classroom teachers.

Objective

The objective of this study was to identify teaching strategies, styles and techniques that enhance learning by special needs students enrolled in Pennsylvania vocational agriculture.

Review of Related Literature

Walker (1980) looked closely at vocational education in New Jersey and stated that "the key to making vocational education work and work well for handicapped students is proper preservice and inservice training for teachers" (p. 22). This training is essential because, according to Hayes (1981), teachers must provide varied and interesting materials and activities to motivate and stimulate creative activity.

Teacher Strategies

Wang and Walberg (1983) coined the phrase "adaptive instruction" which is defined as "the use of alternative instructional strategies and school resources to provide learning experiences that meet individual needs" (p. 603). Wang and Walberg stated there is an underlying assumption in the use of adaptive instruction; students learn in different ways and at different rates. This results in the necessity for effective school programs having both inclusion of a variety of instructional techniques and learning experiences to match the needs of the students. The teacher must know each student's learning characteristics, past performances, level of competence and the nature or type of task he/she can do well.

Wang, Rubenstein and Reynolds (1985) indicated that adaptive instruction greatly improves student learning. They defined a program as being adaptive if it has at least one of the following characteristics: (1) instruction is based on assessed student abilities; (2) students work at their own pace; (3) students receive periodic reports of their mastery; (4) alternative materials and activities are provided; (5) students have a choice of goals and activities; (6) students plan and evaluate their own learning; and (7) students help one another achieve individual goals.

Classroom Physical Environment

Knowledge of the environment-behavior relationship is especially powerful as a tool when used to design arrangements to encourage behaviors considered conducive to learning. "Spaces" affect many classroom behaviors, such as attention span, quality of language interaction, and uses of materials. Spatial organization shapes the quality and the direction of movement and determines which spaces are used. The environment's provisions shape the content and form of the learning activities that can occur within that environment and also have a long-term effect on learning outcomes, influencing knowledge, skills, and thinking processes developed as children use the environment (Loughlin & Martin, 1987).

Teacher Personality and Style

Research by Tuckman and Fabian (1977) indicated that more competent vocational teachers, as rated by supervisors, assistant principals and principals, were significantly more organized and creative, somewhat more dynamic and slightly (n.s., 0.05 level) more warm and accepting. Behaviors associated with planning, evaluating and structuring the learning situation were more prevalent among competent teachers than the human relations aspects of teaching.

Instructional Materials

According to Loughlin and Martin (1987), selection of materials establishes the knowledge content of the environment. Teachers must capture interest by choosing objects and materials that focus on an invitation to investigation. Environmental content is most effective when related to student interests and past experiences, or events in their communities (Van Dongen, 1983, and Martin, 1982, as reported by Loughlin and Martin, 1987), and when it can be presented through concrete objects and literal representations, displayed for access and self-initiated use.

Instructional Activities

Theoretically, adaptation of instruction in a least restrictive environment will increase learning by special needs students. Effective adaptive instruction requires the teacher to be knowledgeable about students' handicapping conditions or other factors which may hinder success in the classroom. Appropriate analysis of the lesson materials with attention to readability and content appropriateness is critical. Lessons designed to increase time-on-task, with a teacher who is well organized and concerned, will result in greater achievement of special needs learners.

Procedures of the Investigation

Study Design

The design selected for this study was ex-post facto with criterion groups. The two groups were special-needs students and regular, non-special needs students.

There were two parts to the study. Part One was designed to determine educational gain of special needs students enrolled in programs of participating teachers; results of Part One were used to carry out Part Two, a series of observations designed to identify techniques, strategies and styles.

The dependent variable was student achievement as measured by increase in mean scores between tests. The independent variable was the overall classroom environment. In addition, there were five active moderator variables: (1) classroom physical environment to include room lighting and arrangement, level of sound, visual displays and equipment; (2) teacher strategies, both overt and monitoring; (3) teacher personality and style as measured by a modified version of the Tuckman Teacher Feedback Form; (4) instructional materials which include categories of published print, unpublished print, visual multi-media, technological, participatory, manipulable and exhibit-type materials; and (5) instructional activities and organization.

A 50 percent stratified random sample of all 320 Pennsylvania vocational agriculture teachers was drawn. Stratification was based on the percent of special needs students enrolled in all schools in the three geographical regions of the state (VEMIS, 1980). Students of these teachers were used as subjects. Human subject clearance was obtained for all participants.

Data Collection

An instrument was developed and reviewed by a panel of experts to determine content validity. Based on the Fry Index, readability was determined to be "2" or second grade. Sixty-four teachers administered a 25-item pretest of general agricultural knowledge to first-year vocational agriculture students. Pretest data were processed to determine the reliability of the test instrument. The Kuder-Richardson 20 Reliability Coefficient (KR-20) for the pretest was 0.65. The researcher decided to eliminate pretest data from any calculations to determine educational gain due to the unacceptable reliability coefficient of 0.65 of the test instrument.

Fifteen questions were added to the posttests to insure a wider range of difficulty to increase the reliability of the pretest instrument. Two posttests were administered for purpose of determining education gain. Only scores of students classified as learning disabled or physically and/or emotionally handicapped were used and these students were classified by their school districts. All 40 questions were randomly arranged for Posttest-1. No format revisions were made to the instrument prior to its administration as Posttest-2. Buff colored paper was used for duplication of the test.

A KR-20 was calculated for revised Posttest-1. Item analysis yielded low discrimination values for seven questions; these were eliminated from all calculations and statistical comparisons. The KR-20 reliability coefficient for the 33 remaining items used for data analysis was calculated to be 0.74. This was considered acceptable based on Tuckman (1985).

Seven teachers were identified as the top ten percent based upon an increase in mean scores of special needs students. After calculations of net mean increases (or decreases) for all teachers with learning disabled or physically and/or emotionally handicapped students who participated in both posttests, participants were placed into two groups: the top ten percent based on net mean increases and all others. A t-test conducted to determine the significance of the difference in net scores of the two groups yielded a significant difference ($t=6.54$, $p<0.001$) among teachers in regard to educational gain between Posttest-1 and Posttest-2.

The second assessment of classroom learning was accomplished through on-site observations of the top ten percent teachers. Observation instruments designed to assess the overall classroom environment were developed and field tested at four vocational agriculture departments in Pennsylvania. Based on the field-testing data, revisions were made to the instruments before use for the actual study. The instruments focused on classroom physical environment, teacher personality and style, teacher strategies, instructional materials, and instructional activities and organization. Results of the observations yielded a profile of teacher techniques, strategies and styles which are characteristics of teachers who worked successfully with special needs students.

The design chosen for this study controlled most threats to internal validity. Random selection of teachers controlled selection bias and mortality. The Hawthorne Effect was controlled by use of the regular, non-special needs students in the sample. Control for testing was necessary since a pretest was used. Spacing the tests at greater than three-week intervals, random rearrangement of the questions for the posttests, and using colored paper for Posttest-2 minimized any testing effects.

Multiple interference was controlled by the fact that classes participating in the study were not likely to be involved in other research at the same time. Conducting the research in the regular classroom controlled reaction arrangements.

Data Analysis

A significance level of 0.05 was established for all statistical calculations using inferential statistics. Characteristics of the successful teacher were identified using the following criteria:

1. Instruments on which data was recorded as "frequent use," "some use," or "no use": The item was characteristic if greater than 65.0 percent of the observations were recorded as "frequent use" or if the combination of "frequent use" and "some use" was greater than 80 percent.

2. Instruments on which data was recorded as "yes, is used" or "no, is not used": The item was characteristic if greater than 50 percent of the observations were recorded as "yes, is used."

3. Teacher personality and style: A score of 80.0 or more indicated a high level of a characteristic, 70.0-79.9 indicated a moderate level and 60.0-69.9 indicated some level of a characteristic.

Results of Observations

Classroom Physical Environment

Data analysis indicated that of the ten items listed as characteristics of a good, safe learning environment (Bear & Hoerner, 1978), seven items fit established criteria as practically different. Two-thirds of the lesson situations observed were in rooms organized appropriately for the lesson, had appropriate lighting and had tools and/or equipment stored according to the design of the shop or classroom. Expendable materials and supplies were stored safely in 62.5 percent (frequently) of the lesson situations, with 31.3 percent of them having some proper storage and 6.2 percent having none. In addition, while hazardous materials were observed as properly stored and labeled frequently during only 55.6 percent of the observations, 44.4 percent had at least some proper storage and labeling of those materials (Table 1).

Teacher Strategy

Five of the 13 teacher strategies investigated were considered overt characteristics of the successful teacher based on established criteria. In two-thirds of the classes observed, teachers asked simple questions frequently, conducted classroom discussions instead of lectures, and performed classroom or laboratory demonstrations. In 59.3 percent of the lessons observed, teachers utilized self-paced laboratory activities or tasks. Silent reading by the student was required frequently during 44.5 percent of the lessons, and some during 37.0 percent of the lessons observed (Table 2).

Almost all teachers gave immediate feedback in all lesson situations. In two-thirds of the classes, teachers observed practice activities of the students and re-taught content, tasks or skills as necessary. Teachers evaluated small tasks frequently in 63.0 percent of the lessons observed (Table 3).

Table 1
Characteristics of the Classroom Physical Environment of the Top 10% Teachers

Environmental Conditions	Frequent Use		Some Use		No Use	
	%	N	%	N	%	N
1. Appropriate organization for lesson	85.7	12	14.3	2	0.0	--
2. Appropriate lighting for lesson	76.5	13	23.5	4	0.0	--
3. Proper storage of tools and equipment	66.7	8	33.3	4	0.0	--
4. Safe storage of expendable materials	62.5	10	31.3	5	6.2	1
5. Area free from distracting sounds	62.5	10	18.8	3	18.8	3
6. Proper storage of hazardous materials	55.6	5	44.4	4	0.0	--
7. All students can see teacher, board, etc.	28.6	4	57.1	8	14.3	2

Note: Any situations non-applicable were not considered in calculations;
N=Number of Observations.

Table 2
Characteristics Overt Teacher Strategies of the Top 10% Teachers

Instructional Strategy	Frequent Use		Some Use		No Use	
	%	N	%	N	%	N
Ask simple questions	74.1	20	22.2	6	3.7	1
Utilizes discussions	66.7	18	11.1	3	22.2	6
Performs demonstrations	66.7	18	22.2	6	11.1	3
Utilizes self-paced tasks	59.3	16	22.2	6	18.5	5
Silent reading by student	44.5	12	37.0	10	18.5	5

Note: N=Number of Observations

Teacher Personality and Style

Based on data analysis of observations of the top ten percent teachers, all teachers possessed a high degree of organization and dynamism and were very warm and accepting of students. They were moderately creative and exhibited some degree of flexibility (Table 4).

Instructional Materials

Based on established criteria, six types of instructional materials were used frequently by the successful teacher. More than 80 percent of the lesson situations observed involved the use of workbooks and teacher-prepared worksheets. In 77.8 percent of the lessons, tools and machinery were being used for hands-on activities at some point during the lesson. Two-thirds of the teachers used visual aids and handouts prepared by them for student use. Laboratory expendable materials such as wood, metal, or paint were used in 59.3 percent of the lessons observed, along with laboratory task or skill sheets (Table 5).

Table 3
Characteristic Monitoring Actions of the Top 10% Teachers

Monitoring Action	Frequent Use		Some Use		No Use	
	%	N	%	N	%	N
Gives immediate feedback	88.9	24	7.4	2	3.7	1
Observes practice activities	66.7	18	25.9	7	7.4	2
Re-teaches, if necessary	66.7	18	25.9	7	7.4	2
Evaluates small tasks	63.0	17	18.5	5	18.5	5
Questions volunteers	44.5	12	40.7	11	14.8	4
Questions non-volunteers	29.6	8	55.6	15	14.8	4

Note: N=Number of Observations

Table 4
Analysis of Teacher Personality and Style

Characteristic	Mean Rating*	Standard**
Organized Demeanor	81.26	82.93
Dynamism	80.00	62.07
Flexibility	65.28	None given
Warmth and Acceptance	92.07	77.28
Creativity	79.44	61.44

* 100.0-80.00+=high degree, 70.00-79.99=moderate degree, 60.00-69.99=some degree.
** From Tuckman, B. W. and Fabian, M. S. (1977), p. 8.

Table 5
Instructional Materials Used Frequently by the Top 10% Teachers

Instructional Materials	Used		Not Used	
	%	N	%	N
Workbooks and worksheets	81.5	22	18.5	5
Tools and/or machinery	77.8	21	22.2	6
Photographs/drawings/transparencies	66.7	18	33.3	9
Teacher-prepared handouts	66.7	18	33.3	9
Laboratory expendable materials	59.3	16	40.7	11
Laboratory task/skill sheets	59.3	16	40.7	11

Note: N=Number of Observations

Instructional Activities and Organization

Data analysis identified six activities as characteristic of those selected by the successful teacher. In all (100.0%) of the lesson situations, students were required to listen to the teacher, whether during classroom discussion or small-group instruction. Most lessons observed (70.4%) involved construction, experimentation or manipulation on the part of the students, as well as writing on programmed materials such as worksheets or workbooks. In two-thirds of the classrooms, students took notes, usually in the form of short margin notes or as an addition to worksheets or handouts. Sixty-three percent of the lessons involved student reading of task or skill sheets, while 55.6 percent of the lessons involved student reading of short passages of textual materials (Table 6).

Table 6
Characteristic Instructional Activities Selected by the Top 10% Teachers

Instructional Activities	Used		Not Used	
	%	N	%	N
Workbooks and worksheets	81.5	22	18.5	5
Listening to teacher	100.0	27	0.0	--
Constructing, experimenting, manipulating	70.4	19	29.6	8
Writing on programmed materials	70.4	19	29.6	8
Note-taking	66.7	18	33.3	9
Reading task or skill sheets	63.0	17	37.0	10
Reading assigned text materials	55.6	15	44.4	12

Note: N=Number of Observations

Summary of Findings

Based on these data, vocational agriculture teachers who work successfully with special needs students were highly organized and creative, generally warm and accepting, and stressed practical application of skills learned by hands-on experience. These teachers were dedicated to teaching and prepared much of their own materials, particularly task sheets and worksheets. Self-paced activities were used frequently. During the instructional process, the successful teacher observed practice activities, graded small task and gave immediate feedback.

Conclusions

In conclusion, this study confirmed existing knowledge about teacher behaviors as a factor in student achievement. Special needs students enrolled in Pennsylvania vocational agriculture programs learned knowledge and employable skills if teachers employed suitable instructional strategies and techniques. It was concluded that successful teachers utilized adaptive instruction techniques such as (1) instruction based on student abilities, (2) students working at own pace, and (3) students receiving periodic reports of their master. Quantitative research has shown that adaptive instruction greatly improves student learning (Wang et al, 1985).

The successful teacher observed as part of this study carefully and consistently selected instructional strategies which proved effective for instruction of special needs students enrolled in their programs. Those strategies included asking simple questions, utilizing classroom discussions with much student input, performing demonstrations, and limited use of text materials with much use of teacher-prepared materials and handouts.

Recommendations

An efficient means to disseminate information from this study to current Pennsylvania agriculture teachers should be developed. Specifically, inservice programs should be developed and offered for presentation and distribution to schools across the state. These programs should focus on adaptive instruction techniques found to be successful by this

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study and others. Specific adaptive instruction techniques recommended by this research are as follows:

1. Teachers should ask simple questions frequently during classroom discussions both of volunteers and nonvolunteers. It is recommended that appropriate questioning techniques, based on objectives for special needs students, be taught to current teachers through in-service and prospective teachers through undergraduate methodology classes.

2. Teachers should conduct demonstrations and discussions of student self-paced laboratory/classroom activities or tasks prior to students performing those activities/tasks. Use of task or skills sheets for all activities is recommended. It is also recommended that some form of hands-on, practice or skills activity be provided for each concept introduced.

3. Teachers should provide teacher-prepared materials, workbooks, and short reading assignments which reinforce concepts covered int he classroom and provide follow-up, hands-on activities. Also, handouts which encourage and teach note-taking skills are recommended.

4. Teachers should observe practice activities and provide immediate feedback, reteaching, if necessary. Task analysis with evaluation of small tasks is also recommended.

5. Teachers should use a variety of visual aids that reinforce and provide visual explanations for concepts and skills.

Particularly, teachers should have access to workshops designed to instruct them in curriculum and materials adaption to the special needs learners. These workshops should be located in areas of the state accessible to all teachers, and offered for continuing education or college credits.

Top priority should be given by the Department of Agricultural and Extension Education, The Pennsylvania State University, and the Pennsylvania Department of Education, to the development of materials for use with special needs students, including worksheets to accompany approved practices books, ditto masters, and workbooks. A guide for use in adapting currently-owned materials should also be developed and mailed to all vocational agriculture teachers.

To insure continuation of quality special needs education in Pennsylvania vocational agriculture programs, it is recommended that information from this study be incorporated into the undergraduate curriculum in agricultural education with suitable practice activities provided. Specifically, learning modules need to be designed which would instruct prospective teachers in (1) safe, efficient classroom design, (2) preparation, selection and purchase of lesson materials for student use, (3) task analysis and evaluation, and (4) effective student monitoring during the learning process (techniques for giving feedback, making observations and, utilizing effective questioning).

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IDENTIFICATION OF TEACHING TECHNIQUES, STRATEGIES, AND STYLES FOR USE WITH SPECIAL NEEDS STUDENTS ENROLLED IN VOCATIONAL AGRICULTURE

A Critique prepared by Arthur L. Berkey, Cornell University

This study address special needs students which all levels of education are required by law to serve. The topic is important given the increase in numbers of these students, especially mainstreamed special education students, enrolling in vocational classes.

The study had a number of strengths. The introduction and literature review documented the problem well. The study design was appropriate for the objectives of the research. The study methodology carefully addressed the issues of instrument reliability and validity. The findings and conclusions were comprehensive and were supported by the data. The low inference teacher behaviors can be operationalized by classroom teachers which provides immediate application for improvement of instruction for special needs students.

Several comments and questions seem appropriate. The purpose is implied but not specifically stated. It would have been useful to have the term "special needs students" defined. It was not clear if the major emphasis was on mainstreamed special education students, or if other low achieving students at some level were also included. A 50% sample size seems large but appears to be used in order to have a sufficient number of successful teachers for phase two on methods and materials. The pretest scores were discarded due to low instrument reliability. This raises the question if an instrument pretest could have identified the problem and a revised instrument resulting in valid data used.

Teacher attitude toward special education students has been found to be important to the success of mainstreaming. Inclusion of this as a characteristic of the classroom environment may have been desirable.

In summary, the study addressed a topic presenting an immediate concern to vocational teachers and the results add significantly to specific low inference behaviors for teachers to meet that concern.

RELATIONSHIPS BETWEEN JOB AND MARITAL SATISFACTION OF SECONDARY AGRICULTURE TEACHERS AND THEIR SPOUSES

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Introduction

Research concerning work-family relationships have focused largely on the differentiation of the two roles. When job satisfaction and work performance are addressed, most writers tend to deal with variables other than and separate from family and personal life. However, it has been shown that the amount of time that a secondary agriculture teacher spends in professional activities, especially after regular school day hours, has a direct effect on the spouse's perception of problems concerning his/her teaching spouse (Coughlin, 1988; Straquadine, 1985). Studies dealing with teacher turnover have noted that the personal and family life of the secondary agriculture teacher can influence actions concerning the professional life. Teachers have indicated that "spouse reaction to job obligation" (Cooper and Nelson, 1981) and "wife not happy with secondary agriculture profession" (Mattox, 1974) are among the reasons they leave the profession.

Studies with specific populations or wide cross-sections of occupations across America have shown positive relationships between job satisfaction and marital satisfaction. Anderson (1984) used the data base of 3,692 respondents from the 1987 Quality of Life in America Survey to find that job satisfaction can be a predictor of marital satisfaction. A direct relationship was found between wives' perceived job satisfaction and husbands' marital satisfaction in a dual career couples study by Albers (1981). And, in a study concerning medical residents' wives (Alexander, 1985) a primary problem to the marital relationship was the small amount of time the husband could spend in family activities. These relationships between job satisfaction and spouse marital satisfaction have not been thoroughly studied within other occupations or within the secondary agriculture teaching profession. Cooper and Nelson (1981, p. 18) suggested that "Research should be conducted regarding the effects of spouse and family obligations as they are related to continuation or level of activity in vo-ag teaching". This study was designed to investigate relationships between job and marital satisfaction of secondary agriculture teachers and their spouses.

Research Hypotheses

1. A statistically significant proportion of the variance in the job satisfaction of secondary agriculture teachers can be predicted by the marital satisfaction of the teachers.

2. A statistically significant proportion of the variance in the job satisfaction of secondary agriculture teachers can be predicted by the marital satisfaction of the spouses.

3. A statistically significant proportion of the variance in the job satisfaction of secondary agriculture teachers can be predicted from the demographic characteristics of the secondary agriculture teachers and/or their spouses.

Procedures

The design of this study was descriptive-correlational. The consequence was the job satisfaction of the married secondary agriculture teachers. Antecedents were the marital satisfaction of the teacher, marital satisfaction of the spouse and the demographic characteristics of the teachers and/or the spouses. Target population of the study was the married secondary agriculture teachers and their spouses in the 13 states comprising the Northeast Region designated by the NVATA. Due to difficulty in identifying married teachers, the population for sampling was the teachers listed in each state's most current directory of secondary agriculture teachers (N=1,541). Estimated proportions of 80% married vocational agriculture teachers and 20% single teachers were derived from previous studies of vocational agriculture teachers and their spouses (Coughlin, 1988; Straquadine, 1985). These estimates were entered into Cochran's (1977) proportional formula for determining sample size. With an expected 75% response rate and 212 questionnaires needed for a statistically representative sample, 283 teachers were drawn using a table of random numbers. Upon return of the survey instruments, only data provided by married teachers were analyzed.

In order to study the relationships between the secondary agriculture teacher's and his/her spouse's marital satisfaction and the job satisfaction of the teacher, two questionnaires that would allow for the proposed statistical analysis were selected. The content measured by the two instruments selected, the Purdue Teacher Opinionaire and the Dyadic Adjustment Scale, was valid and suitable to the population being studied. The Cronbach's reliability coefficient alpha of .96 obtained for the Purdue Teacher Opinionaire and .94 for the Dyadic Adjustment Scale were consistent with reliability coefficients of the scales noted in previous literature. The Purdue Teacher Opinionaire and two copies of the Dyadic Adjustment Scale (one for the teacher, the other for the spouse) and a request for additional demographic data were assembled into a booklet and mailed with a cover letter to the selected teachers. The original mailing, a follow-up letter, and another mailing which included another questionnaire resulted in return of 152 questionnaires, of which 113 were from teachers who were married.

Results

To test for nonresponse bias, the t test analysis of early and late respondents was utilized. Since no statistically significant differences ($p < .05$) were found between the two groups, results of the study were generalized to the target population of married secondary agri- culture teachers and their spouses of the Northeast Region of the NVATA.

Ninety two percent of the teachers responding were males (Table 1). Thirty one percent reported earning less than $25,000 per year, while almost 42% earned over $30,000 per year. A majority of the teachers held 11 or 12 month employment contracts. Almost 56% of the teachers held at least a Masters degree, while slightly less than 50 percent of the spouses held at least a Bachelors degree. Most of the teachers lived in a residence with a rural location. Almost 57% of the spouses were employed full time outside the home. Seventy seven percent of the couples reported having children living at home.

Table 1

Frequencies for Selected Characteristics of Respondents

Characteristic	Frequency	Percent
Gender		
Male	104	92.0
Female	9	8.0
Salary		
< $25,000/year	35	31.0
$25,000 to $30,000/year	31	27.4
> $30,000/year	47	41.6
Teacher's Level of Education		
Bachelors	19	16.8
Bachelors +15	31	27.4
Masters	31	27.4
Masters +15	11	9.7
Higher than Masters +15	21	18.6
Spouse's Level of Education		
High School	57	50.4
Bachelors	38	33.6
Masters	12	10.3
Higher than Masters	6	5.3
Teaching Contract Length		
9 months	11	9.7
10 months	27	23.9
11 months	20	17.7
12 months	55	48.7
Location of Residence		
Rural - farm	59	52.2
Rural - non-farm	26	23.0
Town	10	8.8
City	14	12.8
No response	4	3.5
Spouse Employment		
Full time (40 hrs./wk.)	64	56.6
Less than full time	23	20.4
Not employed	26	23.0
Regularly Attend Church or Religious Activities with Spouse		
Yes	77	68.1
No	36	31.9
Children Living at Home		
Yes	87	77.0
No	26	23.0

There was no difference between the marital satisfaction scores of teachers and those of the spouses (Table 2). The marital satisfaction scores of the couples in this study (113) were very consistent with those found in validation studies for the instrument. The mean job satisfaction score of 272 out of a possible 400 indicates that the teachers were fairly satisfied with their jobs.

Table 2
Means for Selected Characteristics of Respondents

Characteristic	Mean	Std. Dev.
Years Teaching	15.5	8.9
Teachers in Department	2.6	1.7
Students in School	936.8	744.4
Hours of Work per Week	45.7	8.7
Teacher's Age	40.3	9.9
Spouse's Age	38.1	9.2
Years Married	15.3	10.3
Job Satisfaction Total Score	272.3 *	30.2
Teacher's Marital Satisfaction Score	113.8 **	16.0
Spouse's Marital Satisfaction Score	113.8 **	15.5

* Total possible score = 400 ** Total possible score = 151

Pearson Product-Moment Correlation Coefficients (Table 3) were computed for the relationships between the total job satisfaction score of the secondary agriculture teachers and the marital satisfaction score of the teachers, the marital satisfaction score of the spouses and the demographic data. The statistically significant antecedents ($p < .05$) were chosen for stepwise multiple regression analysis to determine the best predictor(s) of the consequence, teacher job satisfaction. The following are the antecedents and their corresponding correlation coefficient with teacher job satisfaction.

Table 3
Statistically Significant Relationships Between Job Satisfaction and Antecedents

Antecedent	Correlation Coefficient	Antecedent	Correlation Coefficient
Years Teaching	r = .32	Spouse's Age	r = .30
Teaching Contract Length	r = .16	Children at Home	r = -.16
Income Level of < $ 25,000/year	r = -.40	Teacher Education Level of > M.S. plus 15 Hours	r = .21
Income Level of > $ 30,000/year	r = .31	Teacher's Marital Satisfaction	r = .25
Years Married	r = .29	Spouse's Marital Satisfaction	r = .28
Teacher's Age	r = .32		

The antecedents to be entered into the stepwise regression equation were chosen according to the significance level of the correlation coefficient regardless of the strength or direction of the relationship. The antecedents were selected, entered into and removed from the stepwise regression equation at the significance level of .05. Data in Table 4 indicate the best predictors of teacher job satisfaction, in order of significance, were the income category of earning less than $25,000 per year, the spouse's marital satisfaction and the presence of children living at home. The total proportion of variance accounted for was 24.95% (R^2 = .2495). The best overall predictor was the earning of less than $25,000 per year.

Table 4
Stepwise Multiple Regression of Teacher Job Satisfaction

Antecedent	Correlation Coefficient r	Multiple R	R^2	R^2 Increment	F
Income Level of < $ 25,000/yr.	-.40	.4052	.1642	.1642	18.67
Spouse's Marital Satisfaction	.28	.4629	.2143	.0501	12.82
Children Living at Home	-.16	.4995	.2495	.0352	10.31

$p < .05$

Conclusions

1. The research hypothesis that a statistically significant proportion of the variance of the job satisfaction of secondary agriculture teachers can be predicted by the marital satisfaction of the secondary agriculture teachers was rejected.

2. The research hypothesis that a statistically significant proportion of the variance of the job satisfaction of secondary agriculture teachers can be predicted by the marital satisfaction of the spouses was accepted.

3. The research hypothesis that a statistically significant proportion of the variance of the job satisfaction of secondary agriculture teachers can be predicted by demographic characteristics of the secondary agriculture teachers and or spouses was accepted only for the demographic characteristics of teacher salary and the presence of children at home.

Recommendations

1. Principals, administrators and boards of education should be aware of the significance salary has on the many aspects of teacher job satisfaction.

2. Secondary agriculture teachers and their spouses should be aware of the influences the spouse's marital satisfaction can have on the teacher's job satisfaction.

3. Secondary agriculture teachers and their spouses need to be aware of the demands of children and family and the possible negative effect on the teacher's job satisfaction.

4. Additional studies recommended include:

    a. A study of other antecedents which may predict a higher proportion of the variance in job satisfaction.

    b. Comparison of the job satisfaction of married and single secondary agriculture teachers.

    c. Comparisons of job satisfaction of secondary agriculture teachers with other teachers and administrators.

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RELATIONSHIPS BETWEEN JOB AND MARITAL SATISFACTION OF SECONDARY AGRICULTURE TEACHERS AND THEIR SPOUSES

A Critique Prepared by Gerald R. Fuller, University of Vermont

The topic is important and of interest to the profession. The paper is well organized and skillfully written. The title reflects the researchable question, "Is there a relationship between job satisfaction and marital satisfaction?" The introduction prepares the reader well.

The three objectives are stated clearly and are reasonable in terms of scope. The researchers are commended for accepting the challenge to predict job satisfaction of secondary teachers of agriculture. However, this objective is global and the intent is really to predict job satisfaction for only those teachers who are married.

Procedures are described adequately. The use of existing instrumentation is commendable (no need to reinvent the wheel). Several questions are not addressed in this paper. For example, was the data collection process pilot tested? The sample is based upon a proportional formula, but there is no discussion to help the reader have confidence that the return rate is acceptable. The statement is made that 212 questionnaires are needed for a statistically representative sample; 152 questionnaires were received, 113 from married teachers. A quick calculation suggests that 170 responses from married teachers is needed.

The follow-up procedures used were appropriate. The researchers looked for differences between early and late responders.

The results are presented nicely, with appropriate and well designed tables.

The conclusions are within the scope of the project and its findings. Recommendations are germane to the findings. The recommendations do not contain references to actions to be taken, and thus leave the reader a bit unfulfilled.

The researchers were right on target with their recommendations for further study.

The list of literature cited is relevant.

JOB SATISFACTION OF COLLEGE OF AGRICULTURE AND FORESTRY TEACHING FACULTY AT WEST VIRGINIA UNIVERSITY

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Job satisfaction of faculty members should be a primary concern of an institution's mission, policy, and administration. According to Brookes & German (1983):

> The essence of a higher education institution is the faculty. . . . It is the faculty who shape the image and the future of their institutions. They are also central to the mission of the institution. It is, therefore, essential that their concerns be heard and addressed. (p.iv)

West Virginia University is an 1862 land-grant institution. Its mission is to teach, conduct research, and provide service to the community.

The College of Agriculture and Forestry is one of 15 colleges and schools at West Virginia University. The situation that the faculty presently face in the College of Agriculture and Forestry will challenge their motivation and energies. According to the Planning Report and Proposal, 1987-88, College of Agriculture and Forestry, West Virginia University: "The College of Agriculture and Forestry is now operating with minimal numbers of faculty and staff in both the College and Experiment Station necessary to fulfill its mission and mandate to this State" (p. 7).

What satisfactions do the College of Agriculture and Forestry faculty find in their present jobs? What do they see as dissatisfying? A study conducted by Austin (1983) states that:

> The teaching, scholarship, and service activities which comprise faculty responsibilities vary in the extent to which each provides the key job characteristics considered important for motivating work. Variety and autonomy seem high for teaching and research activities [sic]. However, fewer opportunities for career growth and pressures for faculty to increase their productivity in particular areas (such as scholarly work) may alter the variety and autonomy generally associated with the professorial role. . . . The loyalties and obligations of faculty members sometimes conflict because of their dual roles in a collegial profession and a hierarchical organization (Baldridge, 1971; Stonewater, 1977). Their values and goals are affected by the standards of their discipline and their work is judged by their professional colleagues. Simultaneously they have responsibilities in the institution's hierarchical structure. (pp. 9-10)

Although job satisfaction will vary among institutional faculties, this study will be concerned with job satisfaction of the teaching faculty of the College of Agriculture and Forestry at West Virginia University. A study of job satisfaction of College of Agriculture and Forestry faculty members has not been conducted within the last decade. Identification of factors which lead to job satisfaction, and ultimately to increased intrinsic motivation among faculty members, is of paramount importance to higher education administrators and the institution. This is especially in an era of need for efficiency and effectiveness in a very complex educational system. The problems facing many universities in the United States since the late 1970's, such as decreasing enrollments, the erosion of faculty purchasing power due to inflation, and other budgetary problems experienced by institutions of higher education make the study of job satisfaction among university academic personnel an appropriate and timely effort. The findings of this study may be utilized by administration to determine the need and justification for faculty development and enrichment programs.

Herzberg (1957) identified various attitude factors which by their presence served as catalysts in the motivational forces of individuals. The purpose of this study was to provide data which would lend itself to empirical analysis and interpretation regarding those factors which satisfy or dissatisfy faculty members who teach in the College of Agriculture and Forestry at West Virginia University. This study will add to the small but growing amount of knowledge on the reliability of the Herzberg Two-Factor Theory to measure job satisfaction of faculty members in higher education institutions.

Objective of the Study

The objective of this study was to determine the job satisfaction/dissatisfaction of teaching faculty in the College of Agriculture and Forestry at West Virginia University (WVU) during spring semester, 1988. In addition, the study sought to determine the extent to which the dependent variable, job satisfaction/dissatisfaction was associated with personal, career, and situational characteristics of the faculty.

Methodology

Descriptive survey research was utilized and data were analyzed using frequencies, percentages, and means; correlational analysis and analysis of variance. A survey instrument was designed by utilizing Bowen's (1980) "Job Satisfaction Questionnaire" which was based on the Herzberg Theory, the Brayfield-Rothe (1951) "Job Satisfaction Index," and selected demographic variables.

The population for this study consisted of all teaching faculty N = 92, on campus and employed, in the College of Agriculture and Forestry at West Virginia University. Responses were received from 90% of the population with all data being usable.

Summary of Findings

Data obtained indicated an overall mean of 47.6 years of age for teaching faculty in the College. Ninety six percent of the respondents were married; and 81.3% were male. Career characteristics indicated that faculty had been teaching at the college level for an average of 17.0 years; 45 were ranked professor, 17 were associate professors, 18 were assistant professors, and one was instructor. Eighty four percent hold doctorate degrees. Eighty two and one half percent were tenured faculty. Sixty four of the respondents had a 12 month employment contract.

Situational characteristics of faculty revealed that 68.8% had not obtained any West Virginia degrees, 16.2 had one WVU degree, two WVU degrees were obtained by 13.8%, and one respondent had three WVU degrees. The study found that 77 respondents taught a mean of 1.55 credit hours at the lower level, 6.56 credit hours at the upper level, and 2.43 credit hours of graduate courses per year. From the five Divisions within the College 21.9% of the respondents were from Resource Management, 28.4% from Plant and soil Sciences, 17.3% from Animal and Veterinary Science, 12.3% from Family Resources, and 21.0% from Forestry.

Data obtained from this study found one moderate relationship between length of contract and the satisfier, Advancement (See Table 1). Years until retirement and the satisfier, Work itself, was found to have a moderate negative relationship (See Table 1). All other relationships were low or negligible.

Table 1

Relationships Between Job Satisfaction/Dissatisfaction Factors and Selected Demographic Variables

Demographpic Variable	N	ACH	REC	W.I.	RESP	ADV
		Job Satisfaction Factors				
***Age (Overall)	80	.1544	.0348	.2732*	.2007*	.0156
**Marital Status	81	-.0578	-.0419	.0429	-.0292	-.1230
**Gender	81	.1145	-.1197	.1191	-.1082	-.2152*
***Yrs Teaching at College Level	91	.1177	.0349	.2157*	.2400*	.0015
**Tenure	81	.0525	-.0867	.0591	.1577	-.0348
**Contract	81	.0176	.2007*	.0432	.2059*	.3114*
***Years Employed at WVU	81	.1121	.0044	.2665*	.1671	-.0054
***WVU Degrees Held	80	.0754	.0095	.0450	.0081	-.1045
***Years Until Retirement	73	.1358	.0173	-.3218*	-.2590*	-.0285

Demographpic Variable	N	P&A	S/T	SALARY	I.R.	W.C.
		Job Dissatisfaction Factors				
***Age (Overall)	80	.0708	-.1122	.1566	.0851	.1780
**Marital Status	81	-.0426	.0878	-.0971	-.0469	-.1298
**Gender	81	-.0071	.1037	-.1793	-.0256	-.0414
***Yrs Teaching at College Level	81	.0585	-.0643	.0936	.1558	.1295
**Tenure	81	-.0484	-.1327	.0653	.0204	-.0015
**Contract	81	.0310	-.0774	.2687*	.2565*	-.0210
***Years Employed at WVU	81	.0794	-.1199	.1032	.1505	.1576
***WVU Degrees Held	80	.1190	.1414	.0034	.1025	.1567
***Years Until Retirement	73	-.0028	.0879	-.0597	-.0268	-.2678*

Note: Abbreviations of satisfiers:

ACH = Achievement
REC = Recognition
W.I. = Work Itself
RESP = Responsibility
ADV = Advancement

Note: Abbreviations of dissatisfiers:

P&A = Policy & Administration
S/T = Supervision/technical
I.R. = Interpersonal Relationships
W.C. = Working Conditions

Note: ** Point Biserial Correlations
*** Pearson PRoduct Moment Correlations
* Significant at the .05 level

Overall College mean ratings of satisfier and dissatisfier factors indicated 'Work Itself' to be the highest satisfier of the teaching faculty (See Table 2). 'Interpersonal Relationships' was also found to be moderately satisfying for respondents. Achievement, Responsibility, Advancement, Working conditions, and Recognition factors were indicated as slightly satisfying by the participants. Policy & Administration and Supervision/technical factors were found to be slightly dissatisfying while Salary was reported as moderately dissatisfying.

Table 2
Mean Ratings of Job Satisfaction/Dissatisfaction Factors, the "Overall Statement," and the Brayfield-Rothe Attitude Index, by All College Faculty

Factor	N	Means	SD
Work itself	81	4.91	.70
Interpersonal relationships	81	4.54	.84
Achievement	81	4.47	.77
Responsibility	80	4.14	.92
Advancement	81	3.81	1.06
Working conditions	81	3.68	.71
Recognition	81	3.51	1.02
Policy & administration	81	3.27	.91
Supervision/technical	80	2.99	1.04
Salary	80	2.44	1.07
'Overall Statement'	80	4.29	1.15
Brayfield-Rothe scale	81	5.04	.64

Note: Rating scale for factors and 'Overall Statement':

1 = Very Dissatisfied
2 = Moderately Dissatisfied
3 = Silghtly Dissatisfied
4 = Slightly Satisfied
5 = Moderately Satisfied
6 = Very Satisfied

Note: Rating scale for Brayfield-Rothe Attitude Index:

1 = Strongly disagaree
2 = Disagree
3 = Moderately disagree
4 = Moderately disagree
5 = Agree
6 = Strongly agree

Conclusions

The following conclusions were generated based on the findings of this study.

1. Job satisfaction and dissatisfaction factors are perceived differently by teaching faculty in the College of Agriculture and Forestry at West Virginia University depending on the personal, career, and situational characteristics that each possesses.
2. Work itself and Interpersonal relationships are moderately satisfying to teaching faculty.
3. Achievement, Responsibility, Advancement, Working conditions, and Recognition (in that order) are slightly satisfying for faculty in the College of Agriculture and Forestry.
4. Policy and administration, and Supervision/technical factors are slightly dissatisfying to faculty; Salary is moderately dissatisfying.

Recommendations

Based on the findings of this study, the following recommendations are submitted:

1. This study was limited to teaching faculty in the College of Agriculture and Forestry at West Virginia University during the spring semester, 1988, and represent a time place sample. A similar study of job satisfaction/dissatisfaction of faculty in other Colleges within West Virginia University should be made to allow comparisons.
2. A regional study of job satisfaction/dissatisfaction in other Colleges of Agriculture and Forestry of land-grant institutions could provide useful information regarding global job satisfaction/dissatisfaction factors.
3. Research is needed to investigate specific cause(s) and/or condition(s) that influence job satisfaction/dissatisfaction indicated in this study.
4. Faculty members should analyze their individual needs and situation utilizing this instrument, or an applicable faculty job satisfaction survey, to determine areas that warrant self improvement programs or provide corrective actions.
5. Administrators and chairpersons need to investigate areas of dissatisfaction for faculty members and implement measures to alleviate dissatisfaction whenever they possess the power to do so.
6. West Virginia leaders who determine the salaries of faculty in the College of Agriculture and Forestry, as well as other institutions, should explore alternative actions and formulate new recommendations and programs in order that the situation can be more satisfying to faculty members.

JOB SATISFACTION OF COLLEGE OF AGRICULTURE AND FORESTRY TEACHING FACULTY AT WEST VIRGINIA UNIVERSITY

A Critique Prepared by David L. Howell, University of New Hampshire

With budgets tight and heavy teaching loads universities are trying to find incentives to keep good faculty members and the study becomes very important. At the University of New Hampshire the President recently spoke of a 22% pay increase for faculty over the next two years but then the realities of a cut in state support hit and now he speaks of possible cuts of specific programs. Not a very high level of job satisfaction for many faculty. Many other universities are caught in the same dilemma.

This study of job satisfaction at the West Virginia University is therefore very timely for many institutions. The objective is clearly stated and the design is appropriate. The survey instrument was identified as Bowen's (1980) "Job Satisfaction Questionnaire" but it is important also for the reader to know the validity and reliability of the instrument. The value of the results cannot be determined without such information.

The authors are to be commended for their high rate of return of 90%. They failed to tell us however how it was achieved. Many of us could learn from their procedures.

It was good to learn that the most satisfying aspect for the teaching faculty was the "Work." It is reassuring that this college faculty enjoys what they are doing. There was not real surprise in the area of dissatisfaction-salary. The next step is to make people aware of this situation who can make a difference as indicated in the last recommendation. I hope studies of this nature don't just gather dust or we will find our colleges without good teaching faculty to shape the minds of future generations. A short sighted view of how to save money for the state seems to be the norm.

Other institutions need to consider their academic climate to make sure they are keeping the best!

A list of references would have been useful to include with this paper.

MAJOR PROBLEMS ENCOUNTERED IN ADMINISTRATING VOCATIONAL AGRICULTURE AS PERCEIVED BY STATE VOCATIONAL AGRICULTURE SUPERVISORS IN THE UNITED STATES

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President Woodrow Wilson signed into law the National Vocational Education (Smith-Hughes) Act of 1917 on February 23, 1917. This legislation was "An act to provide for the promotion of vocational education; to provide for cooperation with the States in the promotion of such education in agriculture and the trades and industries . . ." (Federal Board for Vocational Education, 1917, p.49). Under terms of the Act, a Federal Board for Vocational Education, regional supervisors, a designated state board, state supervisors, teacher trainers, and local teachers began a cooperative effort to deliver vocational education.

Supervisors were primarily responsible for assuring program quality and compliance. Supervisors and teacher educators shared inservice conferences and supervisory tasks. Divisions were organized by occupational areas including agriculture, home economics, distribution, trades and industry, and business and office education. As a result of provisions of the Vocational Education Act of 1963, its subsequent amendments, and other federal legislation concerning elementary and secondary education, major changes occurred in a number of the country's state departments of education. Numerous divisions of vocational education were reorganized according to levels of programs such as secondary, post-secondary, and adult education and by functions such as special needs and career development. According to Barrick (1980), the emphasis in many state departments of education has shifted from supervision of instruction to providing services. Consequences of this shift were documented by Lelle and Kotrlik (1987) who found that while teachers of vocational agriculture rated working relationships between state supervisors and teachers highly, they were somewhat critical of supervisors' efforts to help teachers improve their teaching.

The administration of educational programs in agriculture from the state level has become a growing concern of agricultural educators. The trend away from specialist supervisors for vocational agriculture within state departments of education and toward supervision by generalists has been a major worry. Diminished status for vocational agriculture within state education agencies has resulted (Barrick and Warmbrod, 1981). Maintaining adequate State level supervisory staff and leadership were identified as major concerns of teacher educators, state supervisors and presidents of state vocational agriculture teacher associations by Lawrence and Mallilo (1981). To determine difficulties currently being confronted, this study was designed to identify major problems in State level administration as perceived by state supervisors of vocational agriculture.

Purpose and Objectives

The purpose of this study was to provide information which might be useful to state supervisors of vocational agriculture and other administrators at the state level in identifying and alleviating problems which supervisory personnel are experiencing in program administration and supervision. Specific objectives of the study were:

1. To identify major problems state supervisors of vocational agriculture are currently encountering in administrating state programs of vocational agriculture.
2. To rank identified problems as to their perceived importance.
3. To determine the influence of selected demographics on problems identified.

Method

The descriptive method of research was used in this study. In order to develop a valid survey instrument, a letter of introduction and explanation was mailed to each state supervisor of vocational agriculture (N=50) in the United States along with a request that each supervisor identify the five most critical problems facing him/her in performing the supervisory function. When responses had been received, a committee, composed of two graduate students and two faculty members, then reviewed, sorted and combined statements received and, whenever necessary, edited statements without changing intended meanings. The edited statements were compiled to form the second survey instrument. Methodology employed to identify problems ensured that each statement included in the questionnaire was considered by at least one respondent as a major problem in administrating vocational agriculture at the state level. The second survey instrument, consisting of 92 statements, was administered to the same population. State supervisors were asked to rate each item according to a likert-type scale: 1 - not a problem, 2 - a slight problem, 3 - a moderate problem, and 4 - a severe problem.

The original mailing and two follow-up letters resulted in return of 40 questionnaires, an 80% response rate. Study participants were dichotomized as early and late respondents. Goldhor (1972) found that late respondents are similar to nonrespondents; therefore, one way to estimate the nature of nonrespondents is through late respondents. A t- test analysis found no significant differences ($p<.05$) in ratings of categories of importance between early and late respondents. Thus, the assumption was made that results of the study could be generalized to the entire population of state supervisors. Post hoc tests using Cronbach's alpha estimated instrument reliability to be $r = .98$.

Overall means and standard deviations were determined for each statement. The analysis of variance statistical test was utilized to measure significant differences existing in the expressed level of importance of each statement according to NASAE region. Correlational analysis (r-value) was used to determine the relationships between ratings of items in the problem categories and selected demographics.

An alpha level of .05 was established a priori. The population was assumed to be a sample of state supervisors at a point in time, thus permitting the use of inferential statistics.

Findings

Of the 92 statements rated by study participants, 13 achieved overall mean ratings of 3.00 and above (Table 1). Rated as the most severe problem, with an overall mean of 3.38, was the lack of employment data in agriculture and agribusiness. Interestingly, this problem was identified as the major concern of state supervisors in a 1981 study (Lawrence and Mallilo). A standard deviation of .93, however, indicates an element of disagreement among participants.

Six of the top 13 statements are related to the major problems supervisors have in dealing with increased high school graduation and college entrance requirements and program problems on the local level. The image of agriculture and vocational education were considered major problems in that four statements in the top 13 were concerned with image and understanding of agriculture and the vocational agriculture program by the public and by school administrators. Lack of the adult education component in local programs was also viewed as a major problem. A decrease in state and federal dollars causing reduced local funding support for vocational programs was the only funding category statement to be rated above 3.00.

When statements were analyzed by region, only six significant differences of opinion were detected. Southern region participants rated significantly higher than did others problems associated with the large number of disadvantaged and handicapped students mainstreamed into vocational agriculture programs, the loss of control to local systems, and recruiting, employing and retaining well-qualified state staff. State supervisors from the Western region considered three problems significantly less serious than did others: the decline in student population; the lack of quality teachers; and expansion of "Agriculture in the Classroom" to all elementary schools.

The Pearson product-moment coefficient of correlation was utilized to determine if relationships exist between rating of statements in each problem category and supervisors' ages, years on staff, years of vocational agriculture teaching experience, number of vocational agriculture departments in the state, number of teachers in the state, and number of state personnel. Results are found in Table 2. A statistically significant correlation was observed between the problem category of staffing and the state supervisor's years of vocational agriculture teaching experience. A significant negative correlation was observed between the image of agriculture category and two demographic characteristics--number of vocational agriculture departments in the state and number of vocational agriculture teachers in the state. Based on the scale delineated by Davis (1971), coefficients found in Table 2 indicate a moderate relationship ($r=.33$) between staffing and years of vocational agriculture teaching experience. All other coefficients are considered low or negligible relationships.

Recommendations

1. State supervisors should explore avenues of cooperation with State Labor Departments to develop methods to obtain accurate employment data on jobs related to agriculture and agribusiness in their states.
2. A cooperative undertaking with involvement of state supervisors, teacher educators, agricultural college faculty and administrators, extension personnel, and state department of agriculture personnel is needed to keep the public informed of the importance and value of agriculture and the careers available in the field.
3. Special efforts must be made by state staff and teacher educators to encourage vocational agriculture teachers to develop and include adult education in local programs. Transmission of live, interactive television programs through satellite transmission might be one way to stimulate participation.
4. State supervisors and teacher educators should develop information that could be used by vocational agriculture teachers to inform local school officials of the scope and components of the vocational agriculture program.
5. State Boards of Education should find ways to allow students enrolled in vocational programs to more easily meet high school graduation and college entrance requirements.

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Table 1

Major Problems in Administrating/Supervising State Programs of Vocational Agriculture as Perceived by State Supervisors, with Mean Ratings of 3.00 and Above

Statements	Overall Mean (N=40)	Standard Deviation
Lack of accurate employment data in agriculture and agri-business.	3.38	.93
Increased graduation requirements are preventing students from enrolling in vocational agriculture.	3.35	.77
Creating a viable program that allows students to also meet college entrance and high school graduation requirements.	3.33	.86
Public misunderstanding regarding scope/breadth of "agriculture."	3.28	.75
Society's negative image of agriculture as a career.	3.18	.93
Attracting more capable students to enter careers in agriculture, particularly agricultural education.	3.10	.84
Decline in the student population.	3.08	.97
More stringent college and university entrance requirements are causing a reduction in Vo-Ag/FFA enrollment.	3.08	.94
Combatting the negative image of vocational education.	3.08	.80
Lack of adult education in local programs.	3.05	.84
Increasing Future Farmers of America membership.	3.03	.92
School administrative officials not recognizing the unique characteristics of Vo-Ag, such as SOEP and FFA, as important components of the instructional program.	3.03	.83

Table 1 continued

Statements	Overall Mean (N=40)	Standard Deviation
Reduced local vocational program funding support from state and federal dollars to provide incentives to local school districts.	3.00	.96

Rating Scale:
1 - Not a problem
2 - A slight problem
3 - A moderate problem
4 - A severe problem

Table 2
Correlation of Problem Category Ratings with Demographic Characteristics

Problem Category	Age	Yrs. on State Staff	Yrs. of Vo-Ag Exp.	Vo-Ag Depts State	Vo-Ag Teachers in State	No. State Personnel
Funding	.24	.09	.10	.12	.13	.01
High School Requirements and Program	.16	.10	-.03	-.08	-.07	-.14
Lack of Support	.15	-.02	.06	.07	.07	-.07
Erosion of Authority	.07	-.09	.08	.11	.11	-.07
Staffing	.23	.03	.33*	.13	.14	-.23
Teacher Attributes	.08	.05	-.04	-.13	-.13	-.17
Image of Agriculture	.09	.05	-.09	-.26*	-.26*	-.21
General Problems	.15	.07	.03	.02	.03	-.09

* "r" significant at .05

MAJOR PROBLEMS ENCOUNTERED IN ADMINISTERING VOCATIONAL AGRICULTURE AS PERCEIVED BY STATE VOCATIONAL AGRICULTURE SUPERVISORS IN THE UNITED STATES

A Critique Prepared by Gerald R. Fuller, University of Vermont

This is a topic that has continued to be of interest to the professional for the past twenty years. The study provides us with current information.

The paper is well prepared. The introduction provides the groundwork the reader needs. The researchable question seems to be "What information might be useful to state supervisors of vocational agriculture to help them administer Vocational Agriculture programs." The three objectives address the question.

The methods are appropriate, and well described. The 80% response rate adds strength to the findings. The comparison of early and late responders is interesting, and an important activity.

Regional comparison are important. These data revealed some interesting comparisons on a regional basis. However the regions used are somewhat artificial, being established to serve the geographic needs of an organizational structure (as are most regions). It would be interesting to examine how various states clustered together. For example, there is an indication that states with smaller numbers of programs and teachers may rank their problems differently than states with larger figures.

Mention is made about one item having a standard deviation of .93, and that this suggested an element of disagreement among the respondents. A check of Table 1 indicates six of the thirteen questions have standard deviation above .90. It would be helpful if the researchers had included a brief section on "conclusions" where they could assist the reader understand the issue of standard deviations above .90.

The two tables present relevant information in an easily understood format. The findings are well organized and make comfortable reading.

The recommendations stay within the scope of the findings, a commendable feat. One recommendation seems to be missing. This study obtains perceptions from only state supervisors. It seems wise to identify this as a limit to the study. Finding what other key factors within and outside Agricultural Education perceive as major problems and comparing the findings with this study would provide insight for strategic planning for the future.

MICROCOMPUTER USE AND RESULTING EDUCATIONAL NEEDS OF FARMERS

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Computers and related technology have acquired increasingly prominent roles on American farms. Early in the 1980s, some experts believed that during the balance of the decade, microcomputers would serve a management role similar to the revolutionary role tractors played during the 1930s and 1940s. In reality, incorporation of microcomputer technology on the farm has not progressed as rapidly as predicted.

At present, information regarding the number of on-farm microcomputers is limited and often contradictory. Much of the research which has been conducted has focused on computer competencies needed by agriculture teachers and extension agents. Few studies have been conducted to assess the education farmers need to be effective users of microcomputer technology.

Farmer attitudes regarding on-farm use of computers as well as accurate information about the number and uses of on-farm computers must be determined to plan effective educational programs. By knowing the characteristics of microcomputer users, educators can better target educational programs they deliver. Such information will also benefit individuals who design educational experiences for agricultural professionals working directly with the farm community. Extension agents, agriculture teachers, and other professionals who work with farmers need this information to develop and deliver meaningful educational activities.

Objectives

Four objectives were prepared to guide this investigation of the attitudes farmers have toward and their use of microcomputers.

1. To determine the attitudes farmers have toward computers.
2. To develop a discriminant model to distinguish between farmers who are users or non-users of computer technology.
3. To determine applications being made of computers by farmers.
4. To determine the computer education needs of farmers.

Related Literature

A review of research was conducted to provide an overview of the literature related to the adoption of computer technology by farmers. Numerous researchers have studied the characteristics of on-farm microcomputer technology adopters, current users of on-farm microcomputers, and microcomputer training for farmers.

Robert C. Kramer, Program Director for the W.K. Kellogg Foundation, predicted that by 1990 75% of all mid-size farm operators will use microcomputers or programmable calculators to help make farm decisions (Indiana Cooperative Extension Service, 1982). In reality, adoption has been much slower. McGrann et al. (1985) reported estimates which indicated that 6-8% of all farms had microcomputers; however, not more than 300,000 out of 2.2 million farmers and ranchers used microcomputers. A 1984 study by Yarbrough (1987) showed 7% of New York farmers surveyed had purchased a microcomputer. By 1986 when a follow-up study was done, 12% of the farmers had adopted microcomputers (Yarbrough, 1987). Burhoe (1987, September) estimated 15-18% of all farmers owned a microcomputer. Thus, the research shows that the adoption of on-farm microcomputers has been limited.

Previous management techniques used by farmers have been shown to be very important in determining if a farmer will profit from the use of a microcomputer. Yarbrough (1983) found early adopters of on-farm computers tended to use advanced farm management practices and to be highly interested in general information. Yarbrough concluded that the cost of the equipment or the "user friendliness" would not limit the adoption of the technology. Factors that will limit the adoption include the need of the farmer for advanced management information, the farmer's ability to process such information, and the farmer's perception of his or her role as a manager.

Scherer (1986) wrote, "Farm computer adoptions have slowed, perhaps partly because of the poor farm economy, but also, research suggests, because many farmers don't know what to do with a computer. They simply aren't management oriented, and that is what computers do best" (p. 20).

Along with management ability and need for information, on-farm computer users share other characteristics:

Age: Yarbrough (1987) found that computer usage was positively correlated with a farmer's age; the highest level of adoption was found for the 35 to 44 year old age group. Burhoe (1987, November), in a survey of readers of the Agricultural Computing Newsletter, found that the mean age of farmers who used microcomputers was 42 years old. Dayton (1987), Willson (1987), McGrann et al. (1985), and Cardiff (1985) agreed that farmers who used microcomputers tended to be younger than farmers as a group.

Level of Education: Yarbrough (1987) found a positive correlation between level of education and the adoption of microcomputer technology on the farm. McGrann et al. (1985) described on-farm computer users as possessing more formal education than most farmers.

Size of Farm: Burhoe (1987, November) found on-farm microcomputer users had an mean yearly farm income of $133,525. Yarbrough (1987) reported that farmer adoption of computers was positively correlated with the size of the farming operation. McGrann et al. (1985) found that on-farm microcomputer users were primarily commercial farmers with annual gross sales in excess of $100,000.

Attitude: Rogers (1983) identified attitude as a major determinant in the adoption-rejection decision making process. A negative attitude usually precluded adoption of an innovation; a positive attitude indicated probable innovation adoption. Simonson, Mauer, Montag-Toradi, and Whitaker (1987) found that a positive, anxiety free attitude was necessary for a person to be considered computer literate. In part, a positive attitude was needed because rapid and continuous changes in the use of the technology were required.

In a report of state-of-the-art computer use, Lantz (1984) emphasized the need to teach farmers the practical applications of computers, including advantages and disadvantages of various software programs.

Microcomputers can be powerful farm management tools. Research relative to on-farm microcomputer use indicated that younger farmers with larger than average farms and good management skills were most willing to adopt microcomputer technology. A "computer positive" attitude was also necessary before adoption occurred. Further research regarding types of programs and training for farmers who have adopted or will adopt microcomputer technology is necessary to develop meaningful educational programs.

Methods and Procedures

The design used in this study was descriptive survey research. The target population included 88,000 Ohio farmers (Ohio Agricultural Statistics Service, 1986). A stratified random sample of 400 farmers was selected as recommended by Krejcie and Morgan (1970). The sample size provided the researchers with a 95% level of confidence. The names and addresses of the farmers were taken from agricultural mailing lists supplied by 15 randomly selected county offices of the Ohio Cooperative Extension Service (OCES). Three counties were selected from each of the five OCES districts to ensure a variety of farm sizes and enterprises. The number of farmers selected from each county was based on the proportion of farmers in the county. A mailed questionnaire and telephone interview schedule were developed for data collection following guidelines given by Dillman (1978). A panel of computer-literate faculty and graduate students at The Ohio State University reviewed the questionnaire to determine its content and face validity. The two instruments were pilot tested using members of two Ohio Young Farmer chapters (n=36) from counties not included in the sample. The attitude scale was found to have acceptable reliability (Cronbach's alpha =.92).

Usable data for the study were collected from 204 farmers between March 2 and May 20, 1988. Statistical comparisons of early (n=160) and late (n=89) respondents was conducted, as recommended by Miller and Smith (1983). The two groups were compared using the independent t-test and chi-square statistics. The two groups did not differ in age, level of education, farm size and primary farm enterprise (p>.05). There were significant differences (p<.05) between early and late respondents in attitude toward microcomputers and intention for training in the use of microcomputers.

Follow-up telephone interviews were conducted with respondents whose mailed questionnaire indicated that they used a microcomputer for farm business applications. The researchers used the interviews to collect data about microcomputer use on farms and the types of educational programs the users had attended.

Data from the mailed questionnaires and telephone interviews were coded into appropriate categories. Statistical procedures used to analyze the data included descriptive statistics to portray the sample. Discriminant analysis and other multivariate correlational techniques were used to examine relationships among selected variables. The data were analyzed using the SPSS/PC+ statistical package (Norusis, 1986).

Findings

Farmers participating in the study ranged from 20 to 80 years of age; the mean age was 50 years. Most of the farmers (45.6%) stopped their formal education at the high school level. A total of 19.6% of the farmers had completed some college courses; 20.6% had completed a bachelor's degree. Education beyond the bachelor's level had been completed by 4.9% of the farmers.

There was wide variation in the number of acres each farmer was farming; the mean was 373 acres. Slightly more than 60% of the farmers were farming less than 400 acres. Fewer than 9% of the farmers were farming more than 900 acres. Of the farmers surveyed, 41.8% listed "crops" as their main farm enterprise. The "crops" category was comprised mainly of corn and soybeans. "Livestock" was the second largest farm enterprise (34.2%); dairy, beef and swine were the main livestock components.

Attitude Toward Computer Use

Farmers indicated their level of agreement or disagreement with statements about the use of computers. A Likert type scale with 1 meaning "firmly disagree", and 6 indicating "firmly agree" was used to measure attitude. Farmers tended to have a positive attitude toward the use of microcomputers (mean=4.2). The strongest agreement was recorded for the statement: "Microcomputers should be used by businesses, not by farmers like me" (mean=4.7). They expressed the most disagreement with the statement: "To use a microcomputer would take a lot of technical training" (mean=3.8).

Microcomputer Users and Non-users

A model was developed to determine characteristics which will explain whether or not farmers use microcomputers. Thirty-nine farmers (19.1%) used a microcomputer for farm business purposes. Data analysis by mailed records was used by 29 farmers (14.2%). Farmers who used a microcomputer (either owned or leased) were categorized as USERS (n=39) and those who did not were categorized as NON-USERS (n=165).

All users had completed high school; most had some college. Most of the non-users (63%) did not have an education beyond high school. Users tended to be younger than non-users (42 vs. 50 years old). Users also tended to farm more acres than non-users (637 vs. 318 acres). Microcomputer users also had a more positive attitude toward agricultural use of computer technology, and a stronger interest in microcomputer training and educational activities.

The data in Table 1 indicate that there were significant relationships between selected variables examined in the study. Terms used to describe relationships were selected from Davis (1971). A substantial relationship existed between use of microcomputers and attitude (r=.50). The relationship between attitude and interest in further microcomputer education was of moderate magnitude (r=.54). A negative relationship of moderate strength was found between attitude and age (r=-.40); younger farmers had a more positive attitude toward microcomputers. The relationship between interest in further education and microcomputer use was also of moderate strength (r=.34).

Table 1
Interrelationships Among Computer User, Interest in Pursuing Computer Education Activities, Attitude, Age, Education, and Farm Size

Item	1	2	3	4	5	6
Computer User (1)	--	.34*	.50*	-.21*	.23*	-.29
Interest in Computer Ed (2)		--	.54*	-.26*	.15	.15
Attitude (3)			--	-.40*	.32*	.19*
Age (4)				--	-.18*	-.24*
Level of Education (5)					--	.08
Farm Size (6)						--

* Significant at the .01 level; n = 180

The data presented in Table 2 indicate that 77% of farmers were correctly categorized as computer users or non-users based on the variables included in a discriminant model. Attitude toward computers was the best indicator of computer use. Farm size and interest in receiving computer education were the next two best indicators of whether or not farmers used microcomputers. Level of education was the only other variable shown in Table 1 that was useful in categorizing farmers as computer users or non-users.

Table 2
Discriminant Analysis Performed to Determine Ohio Farmers Who Are Users and Non-Users of Microcomputers on Their Farms

Function Derived	Eigenvalue	Canonical R	Wilks Lambda	Chi Square	df	Sig.
User/Non-User	.47	.57	.68	69.7	4	.00

Variables Comprising Discriminant Function

Variable	F to Enter*	Wilks Lambda	Standardized Discriminant Coefficient
Attitude Toward Computers	64.5	.740	.86
Farm Size	12.9	.691	.51
Interest in Computer Ed	1.8	.684	.57
Educational Level	1.2	.680	.35

* *p* < .05, *df*= 1, 183.
77.3% of the cases correctly classified by the model

Farm Applications of Computers

Most of the 39 farmers who used microcomputers (80%) used them to keep business accounting records such as credit payment records and wages for labor. Business planning, which includes budget preparation and cash flow statements, was conducted on microcomputers by 29 of the 39 farmers. Slightly over half of the farmers kept production records and wrote correspondence using microcomputers. Almost half (17) used a microcomputer for computing tax form information.

Of the 39 microcomputer users interviewed, 11 (28.2%) had been accessing an electronic information service for almost three years. Nine of the 11 said that marketing information was their primary reason for accessing the service. Ten of the users commented that there was a lack of agricultural software.

Computer Education Needs

The primary computer instruction that farmers had received was through a college or university course. The mean number of hours of instruction each farmer had acquired was 31.4. Commercial computer education programs such as those sponsored by the Ohio Farm Bureau Federation were the next most popular type of instruction. Most users reported that they had taught themselves to use computers either alone or in conjunction with an instructional tutorial program.

Seventy farmers (34.3%) indicated that they would actively pursue instruction about the use of microcomputers during 1988-1990. Farmers are more interested in incorporating microcomputers into their record keeping system than learning how to use specific types of software or an on-line system.

Conclusions

The following conclusions are made based on the objectives of the study.

1. Farmers tended to express positive attitudes about on-farm microcomputers. In general, younger farmers with a higher level of education and larger farms tended to have more favorable attitudes.
2. Attitude and farm size were the best determinants of microcomputer use and non-use. Non-users tended to have (a) less favorable attitudes toward microcomputers and (b) smaller farms.
3. Microcomputers were used for farm applications by a fifth of the farmers; slightly over half had adopted microcomputers within the last two years. Efficient record organization was the primary reason for adopting computer technology. On-farm microcomputers were used for business accounting and planning by the majority of users.
4. Interest in microcomputer education was expressed by a third of the farmers. The preferred training focused on practical management uses rather than specific skill acquisition. The majority of the users were self-taught or had received instruction through their college experiences.

Implications

1. The increase in the number of microcomputers on farms within the last two years provides agricultural educators with new challenges to meet the educational needs of farmers.
2. A considerable number of farmers need basic information about general uses of microcomputers. Agricultural educators should be aware of the needs of users, especially those who have recently acquired microcomputers. These users may recognize the need for increased management capabilities, but may not be aware of how a microcomputer can fulfill that role.

Recommendations

1. Microcomputer education programs should be based on the expressed needs of farmers. Such programs should also be at the appropriate knowledge and experience level of the clients.
2. Advanced educational programs should be targeted to farmers who are already effective farm managers; farmers with larger operations will be more likely to use on-farm computers.
3. Educational programs about computers should emphasize the need for farm management and how computers can fit into a good farm management plan.

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MICROCOMPUTER USE AND RESULTING EDUCATIONAL NEEDS OF FARMERS

A Critique Prepared by Gerald R. Fuller, University of Vermont

The paper is well written and a pleasure to read. The research topic is appropriate and the results of this study will be of interest to a wide variety of agricultural educators. The researchable questions seems to be (1) What do farmers use computers for?, and (2) What do they need to know in order to use computers?

The excellent introduction sets the stage for the reader.

The objectives are concisely stated. Objectives 3 and 4 are sharply focused upon questions of "use and needs". Objectives 1 and 2 expand the study beyond the "researchable questions" and into the realm of attitude and characteristics of farmers. The researchers are commended for the development of "... a discriminant model to distinguish between farmers who are users or non-users", and for the determination of general applications of computers being used by farmers.

The fine presentation of related literature provides important background information. It lays a groundwork for comparing the results of this research with previous studies.

Methods and procedures are thoughtful and well presented. A stratified random sample is a good choice of techniques. However, some questions remain after reading this section. It is not clear how the counties and county offices were stratified. The proportional sampling of farmers is a worthy technique. A parallel process of proportional sampling of counties (ex: number of farmers in each county) would strengthen the research.

The use of a validity check is commendable. Even more commendable is the comparison of early responders and late responders. But what about a comparison of responders and non-responders?

The findings are clearly stated, and organized to address each of the objectives. The tables are clear and appropriate. The researchers have tried not to state any conclusions in the presentation of findings, which is commendable. Conclusions are stated positively and confidently.

The researchers have attempted, in their statements of implications and recommendations, not to overreach the findings. It seems that attitude is a key element that needs tending to. The recommendations address education about computers and the use of computers for the management of farms. A reference to "attitudes" would be a welcome addition.

PERCEPTIONS OF AGRICULTURE FACULTY AT LAND GRANT INSTITUTIONS IN THE NORTHEASTERN UNITED STATES CONCERNING THE LAND GRANT MISSION

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Introduction

Land grant colleges and universities have played a major role in the improvement of agriculture and industry, not only in the United States, but world wide. A dedication to the mission of teaching, research, and service has been the key to success of the land grant system. "There are three major missions of the modern university: research, teaching, and public service - interdependent and mutually reinforcing, static while alone, dynamic in combination, these missions give a modern university its unique strength" (Duncan, Singh, & El- Omari, 1967, p. 15).

It has been the responsibility of faculty to perform in all areas of the land grant mission. "Most faculty have dual responsibilities, with some combination of teaching, research and extension. A few work with all three" (Knoblauch, Law, & Meyer, 1962, p. 6). In more recent times, however, faculty have felt the need to place more emphasis on research because of an advancement system which tends to reward research productivity and overlooks teaching or service activities. According to Gonzalez (1987) "...Tenure and promotion decisions are based primarily on research performance..." (p. 7). "Teaching, research, and service describe the threefold mission of the land grant university" (Kelly & Warmbrod 1986, p. 27). It is the dedication to all three areas of the mission that makes the land grant institution a truly unique concept in higher education.

Purpose and Objectives

The purpose of this study was to solicit the opinions of faculty in colleges of agriculture in the Northeastern United States regarding the importance of the threefold mission of land grant institutions. Information obtained from this study might prove helpful to administrators and faculty in improving and understanding faculty performance in each of the three areas of the land grant mission. The following objectives provided direction for the study:

1. To determine the perceived importance placed on teaching, research, and service by agriculture faculty at land grant institutions.

2. To determine perceptions of faculty regarding the extent to which teaching, research, and service are considered in faculty promotion and tenure decisions.

3. To determine faculty perceptions of support received for activities in the areas of teaching, research, and service.

4. To determine relationships between perceived importance, support, and consideration of teaching, research, and service and faculty demographic characteristics.

Procedures

Data for this study were obtained using descriptive survey research methods. Following a review of literature the researcher developed a survey instrument to collect the data necessary to meet the objectives of the study. The instrument asked faculty to rate the importance of teaching, research, and service on a scale of one to seven, with one indicating a very high and seven indicating a very low rating relative to questions concerning the importance, support, and consideration given to each area of the land grant mission. Reliability of the instrument was determined to be r = .82 using the unequal length Spearman-Brown technique.

The target population was agriculture faculty employed at 13 land grant institutions in the Northeastern United States (N=1500) during the spring of 1988. Faculty members who held Cooperative Extension or administrative positions were excluded from the study. Krejcie and Morgan's (1970) proportional random sampling technique was used to select a group of faculty (n=300), who were mailed survey instruments. A total of 233 faculty members returned completed surveys, which provided a 77.6% response rate. To control for nonresponse bias early and late respondents were compared using the Mann - Whitney U statistical test. Responses were found to be similar, therefore it was assumed that nonrespondents were analogous to the respondents.

Analysis of Data

Data obtained from the study were analyzed using the Statistical Package for the Social Sciences, version x (SPSS-X). Descriptive and nonparametric statistics were used to analyze and summarize the data. For each of the characteristics of interest descriptive data were analyzed in the form of frequencies, percentages, means, and medians. Nonparametric statistics were used to determine the extent of relationship and agreement between selected demographic characteristics and perceived importance, support, and consideration for teaching, research, and service activities.

Results

Faculty were asked to respond to nine statements indicating how they would rate the importance of teaching, research, and service relative to each of the statements. Possible responses were arranged on a seven point scale, with one signifying a very high and seven signifying a very low rating. In response to seven of the nine statements research received the highest median ranking; importance to this land grant institution (Md=1.0); priority to you as a faculty member (Md=1.0); nonfinancial support (Md=3.0); encouragement of colleagues (Md=2.0); financial support (3.0); weighting in promotion and tenure decisions (Md=1.0); and importance to administrators relative to promotion and tenure decisions (Md=1.0). Teaching and service were ranked equally relative to the perceived importance to the land grant institutions (Md=3.0) and to administrators relative to promotion and tenure (Md=4.0). Faculty felt that teaching and research should be considered equally in promotion and tenure decisions (Md=2.0) and also rated them equally with regard to personal preference (Md=2.0).

Table 1
Median Ratings of Importance, Support, and Consideration of Teaching, Research, and Service

	Teaching	Research	Service
Importance to this land grant institution.	3.0	1.0	3.0
Preference to you as a faculty member.	2.0	1.0	4.0
Priority to you.	3.0	1.0	4.0
Nonfinancial support received for performance in each area.	4.0	3.0	5.0
Areas in which performance is encouraged by colleagues.	3.0	2.0	5.0
Financial support received for performance in each area.	4.0	3.0	6.0
The weighting of each in promotion and tenure decisions.	4.0	1.0	5.0
How you feel that each should be weighted in promotion and tenure decisions.	2.0	2.0	3.0
Importance to administrators relative to promotion and tenure decisions.	4.0	1.0	4.0

1 = Very High
7 = Very Low

In this study, service was divided into three categories: college or university service, professional service, and public service. Faculty were asked to rank these three categories of service based on the amount of time spent on each one. Respondents ranked service to the college or university as consuming the most time and public service as consuming the least.

Table 2
Median Rankings of Amount of Time Spent in Service Activities

Area of Service	Median
College or University	1.0
Professional	2.0
Public	3.0

Almost 48% of the respondents held the rank of professor. The mean years of experience at the college or university level was 17.1 years and the mean age of respondents was 48.4 years. Eighty-eight % of the respondents were male and 12% were female.

Table 3
Characteristics of Respondents

Characteristic	Frequency	%	Mean
Academic Rank			
Professor	111	47.6	
Associate Professor	90	38.6	
Assistant Professor	30	12.9	
Instructor	2	0.9	
Total	233	100.0	
Number of Years Teaching at the College or University Level			
31 - 40	18	7.7	
21 - 30	65	27.9	
11 - 20	81	34.8	
0 - 10	69	29.6	
Total	233	100.0	17.1
Age			
61 - over	26	11.3	
51 - 60	73	31.3	
41 - 50	73	31.3	
31 - 40	61	26.1	
Total	233	100.0	48.4
Gender			
Male	205	87.9	
Female	28	12.1	
Total	233	100.0	

The mean numbers of undergraduate and graduate classes taught per year were 1.85 and 0.94, respectively.

Table 4
Number of Courses Taught at the Undergraduate and Graduate Levels

Number of Courses	Undergraduate			Graduate		
	F	%	Mean	F	%	Mean
0	39	16.7		77	33.0	
1	70	30.0		110	47.2	
2	70	30.0		31	13.3	
3	27	11.6		12	5.2	
4	11	4.7		1	0.4	
5	3	1.3		1	0.4	
6	7	3.0		0	0.0	
7	3	1.3		0	0.0	
8	2	0.9	1.85	0	0.0	0.94

Spearman rank order correlation coefficients were calculated to determine if relationships existed between the rankings of teaching, research, and service and the demographic characteristics. In response to nearly all statements there was a low to moderate negative correlation between number of courses taught at the undergraduate level and the perceived importance, support, and consideration of research and service. This indicated that the more undergraduate level courses taught the lower the faculty member rated research and service activities. There was a low positive relationship between age, years of experience, and academic rank for teaching and service relative to the preference of faculty. This suggests that faculty with higher ranks show a slightly greater preference for teaching or service activities, probably because they are not as concerned with promotion and tenure which they perceive to be based primarily on research productivity.

To determine the extent to which faculty agreed on each survey statement Kendall's coefficient W was computed (Table 5). Faculty generally agreed on the weighting of teaching, research, and service in promotion and tenure decisions (.73) and the importance of each component of the land grant mission to administrators relative to promotion and tenure (.69). Faculty members showed the lowest degree of concordance on the statement rating their preferences for teaching, research, and service activities (.22).

Table 5
Agreement of Respondents on Survey Statements

	Mean Ranks			
	Teaching	Research	Service	W
Importance to this land grant institution.	2.11	1.42	2.47	0.40
Preference to you as a faculty member.	1.88	1.65	2.47	0.22
Nonfinancial support received for performance in each area.	1.95	1.50	2.55	0.34
Areas in which performance is encouraged by colleagues.	1.98	1.52	2.50	0.34
Financial support received for performance in each area.	2.07	1.36	2.58	0.45
The weighting of each in promotion and tenure decisions.	2.05	1.34	2.61	0.49
How you feel that each should be weighted in promotion and tenure decisions.	2.18	1.12	2.71	0.73
Importance to administrators relative to promotion and tenure decisions.	1.79	1.68	2.54	0.41

* Kendall's Coefficient of Concordance 0=no agreement, 1=total agreement

Conclusions

Within the limitations of the study and based upon the results the following conclusions were derived:

1. Faculty perceive research to be the most important function of land grant institutions, followed by teaching and service which are considered equally important.
2. Faculty equally prefer teaching and research over service activities.
3. Faculty feel that research is the most highly supported activity at land grant institutions, followed by teaching and service, respectively.
4. Faculty believe that research is given the most consideration in promotion and tenure decisions, followed by teaching second and service third.
5. Faculty feel that teaching and research should be given equal consideration in promotion and tenure decisions.
6. Faculty believe that administrators place a great deal of importance on research and about equal emphasis on teaching and service in promotion and tenure decisions.
7. Faculty are encouraged more by colleagues and receive more financial and non-financial support for research than for teaching and service.

8. Faculty devote more time to college or university and professional service than to public service as defined in this study.

Recommendations

Based on the results of this investigation the following recommendations are offered:

1. Further research should be conducted to examine the viability of the threefold mission of land grant institutions. Perhaps the traditional delivery of the threefold mission is no longer necessary, or is in need of change.
2. Further research should be conducted at land grant colleges and universities to determine the extent to which these institutions are carrying out the teaching, research, and service mission.
3. Faculty and administration should work together to identify ways by which to evaluate the success of colleges of agriculture in carrying out the land grant mission of teaching, research, and service.

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PERCEPTIONS OF AGRICULTURE FACULTY AT LAND GRANT INSTITUTIONS IN THE NORTHEASTERN UNITED STATES CONCERNING THE LAND GRANT MISSION

A Critique Prepared by David L. Howell, University of New Hampshire

It is important in any work setting to know what the "rules of the game" happen to be and the university environment is no exception. The title of this report might better reflect the study if it were "Rules of Survival in a Land Grant College or University." The topic is important for those new to the profession who have a hard time saying "no" to added teaching and service activities without attending to their research and publication needs.

The objectives were clearly identified and an appropriate design was used for the study. The reported instrument reliability of 0.82 was good but the population from which it was determined was not identified. It is also important to report on the validity of the instrument used. A responses rate 77.6 is good but it is important to sample the non-respondents. A comparison of early and late respondents may not be an indication of non-response bias.

In reporting the data it appears that both the median and mean ratings were used in reporting the same results. It would be interesting to know the rational since median ratings are less useful in reporting central tendency.

The findings show the high importance of research for promotion and tenure decisions in our universities and the lower importance of teaching and service. The message then for those entering into employment with universities is for survival get as much research time as possible. Yet the reality is that most will start with a 100% teaching assignment. This study is important in making this point which many may not have known. It is also time for faculty to act to change the criteria so teaching and research will be weighted equally.

This topic should be of concern to all who are in colleges and universities.

STAKEHOLDER PERCEPTIONS OF PENNSYLVANIA 4-H

Arlen Etling, Assistant Professor
The Pennsylvania State University

> ...Extension struggles with multiple identities. Multiple images provide a base that is not dependent upon a single client group; however, there is a lack of comprehension of the overall organization through which the programs are delivered. (Warner and Christenson, 1984, p. 53)

In their national assessment of the Cooperative Extension Service, Warner and Christenson (p. 46) mentioned the crucial need for a public agency to communicate with its publics. A superior service, they observed, will rarely sell itself.

According to Ladewig and Thomas (1987, pp. 120-121), 4-H offers a superior service: personal development. They found that youth development programs in general, and 4-H in particular, can make a difference to 4-H participants and to society. 4-H professionals in Pennsylvania agreed with this conclusion but they were concerned that the public might not be aware of the benefits of 4-H. Because a significant portion of 4-H funds come from county and state tax sources, public support for 4-H was essential.

Administrative changes in Pennsylvania 4-H also caused concern. Within the past three years a new State 4-H Director, a new Extension Director and a new Dean of the College of Agriculture at the Pennsylvania State University, brought new approaches to the program which included merging the 4-H program into the Department of Agricultural and Extension Education. In 1987 regional 4-H administrative positions were eliminated. Also in 1987 the Pennsylvania Legislature approved a $5 million appropriation to strengthen Cooperative Extension in the state. This money allowed frozen positions to be filled and added new 4-H positions at both the county and state levels. Such sweeping changes raised more concern about the image of 4-H.

> If the public's image of the organization differs substantially from that held by the agency, then either the organization is not successfully representing itself to the public, or organizational members are not reflecting the reality of the agency's programs. Either of which is reason for concern. (Warner and Christenson, 1984, p. 55)

Objectives

Such concerns provided the background for a study to determine the public's perceptions of Pennsylvania's 4-H program. Specific objectives were:

1. To describe stakeholders' perceptions of Pennsylvania 4-H;
2. To describe the current 4-H program in Pennsylvania according to 4-H professionals; and
3. To compare the professionals' perceived program model with stakeholders' perceptions.

Methods

Quantitative research methods did not seem to be suited to address the objectives of this study. 4-H specialists agreed with McKinney's (1987) concerns that quantitative research relies too much on an empirical-analytical perspective, does not sufficiently consider the context of programs being studied, and excessively emphasizes separate and discrete outcomes.

A qualitative research approach, evaluability assessment, seemed most appropriate to achieve the objectives of the study. Evaluability assessment is a procedure which

> ...explores and documents: the program objectives, expectations, and casual assumptions of policy-makers and managers in charge of program; what political groups (Congress, Executive Branch policy-makers, and interest groups) say the the program objectives are; the extent to which management's program objectives and information needs have been defined in measurable terms; the program activities actually under way; the likelihood that program activities will achieve measurable progress toward program objectives; likely uses of information on program performance; and options for changes in program activities, objectives, and use of information that could enhance program performance. (Wholey, 1979, p. 18)

An evaluation specialist at the U.S. Department of Agriculture agreed to assist with the study. He was in the process of conducting a number of evaluability assessments for different state Extension programs to validate the method.

Steps in the evaluability assessment followed those described by Wholey (1979) and adapted by Mayeske (1986). A study committee was formed to represent Pennsylvania 4-H at all professional levels. Members included five county 4-H agents, two state 4-H specialists, the state 4-H program director, the state Extension evaluation specialist, and a federal Extension evaluation specialist.

Through structured discussions the study committee formulated a program logic model of 4-H program inputs and results (Figure 1) and specified activities and indicators of accomplishment at each stage of the model.

Next the study committee identified groups of Pennsylvania residents besides 4-H members who had a stake in the 4-H program's development, implementation, reputation or impact. These 13 groups, designated "stakeholders," included Penn State University administrators, College of Agriculture administrators, county commissioners, state legislators, State 4-H Foundation directors and donors, county Extension advisory committee members, county Extension directors, county 4-H coordinators, other county agents with 4-H responsibilities, 4-H volunteer leaders, parents, state 4-H specialists, and representatives of other agencies that work with 4-H.

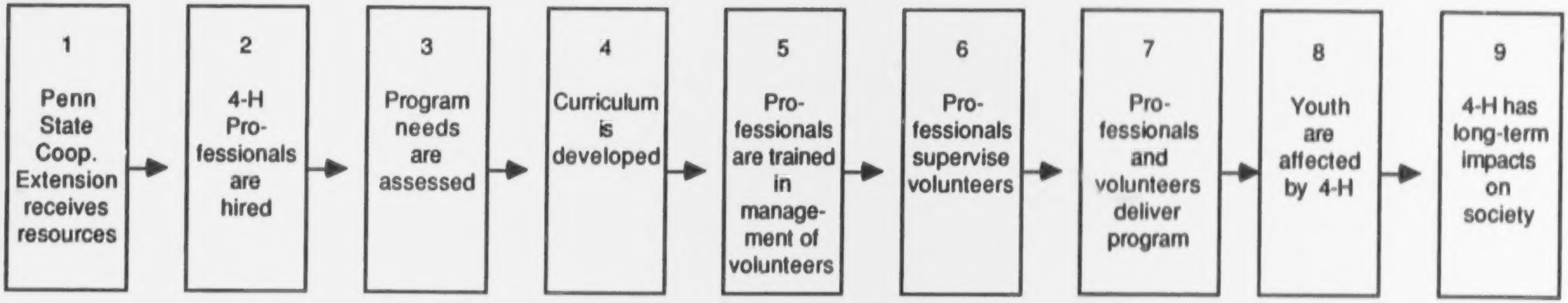
1
Penn State Coop. Extension receives resources
2
4-H Professionals are hired
3
Program needs are assessed
4
Curriculum is developed
5
Professionals are trained in management of volunteers
6
Professionals supervise volunteers
7
Professionals and volunteers deliver program
8
Youth are affected by 4-H
9
4-H has long-term impacts on society

Figure 1

LOGIC MODEL -- PENNSYLVANIA 4-H

Data Collection Procedures

A purposive sample of 47 individuals including at least three representatives of each stakeholder group was chosen by the study committee. The sample was balanced geographically, ethnically, and by gender. Then the committee developed an interview questionnaire which was critiqued by federal and state evaluation specialists for its content validity.

Four students in the Extension Education Minor at Penn State University and the state evaluation specialist agreed to conduct the interviews. Four hours of training on the basic principles of interviewing were completed by all interviewers who were trained to deal with a variety of situations that could affect the validity of the interviews. Neutrality and consistency were emphasized. Standardized answers were developed for potential queries about the meaning of certain questions and the reason for the study. The interviewers piloted the questionnaire with six stakeholders who were not chosen for the purposive sample.

Stakeholders in the sample were contacted by letter, then by telephone. In some cases the interview was completed on the first contact. In other cases up to 14 calls were needed, usually because secretaries were screening calls for their employers. Several sensitive interviews were conducted in person by the state evaluation specialist. Interview questions dealt with stakeholder perceptions of the purpose of 4-H, who is served by the program, roles of agents and specialists, adequacy of resources, and necessary changes in 4-H to meet future needs. (Figure 2)

In the end, 45 interviews were completed (96% completion rate). Each interview was taped and transcribed. The typed transcriptions were placed in folders by stakeholder category for analysis. All names were deleted from transcribed copies to protect the anonymity of stakeholders.

1. What are your overall perceptions of the 4-H program in Pennsylvania?
2. What do you think is the purpose of 4-H?
3. Do you think the purpose of 4-H should be different?
4. Who is served by the 4-H program?
5. What are the effects of the 4-H program on the participants; in other words, how are they different as a result of being in the program?
6. What is the County Extension staff expected to do to bring about the effects of the 4-H program?
7. What is the State Extension staff on campus expected to do to bring about the effects of the 4-H program?
8. Do you have any other thoughts about how the 4-H program is carried out?
9. Do you think the resources of the program are adequate? (If "No," ask, "What more is needed?")
10. If the 4-H program were to undergo a formal evaluation, what would you like to know about it?
11. What do you think is the future of 4-H in Pennsylvania?
12. In what ways do you think the 4-H program should change to meet future needs?
13. Is there anything else you would like to mention concerning the 4-H program in Pa.?

Figure 2
Interview Questionnaire

Data Analysis

The study committee met a second time to review the interview results. In accordance with accepted procedure for this type of qualitative study (Wholey, 1979; Mayeske, 1986), a structured group discussion was used by the study committee. This allowed the study committee to consider the context of the 4-H program while analyzing and comparing perceptions of discrete parts of that program. In pairs, committee members read and summarized the typed transcripts from each stakeholder category. Responses among stakeholder categories were compared. Then the committee compared stakeholder perceptions with the logic model (Figure 1).

Findings

For objective one, stakeholders' perceptions of 4-H in Pennsylvania were identified from the interview transcriptions. Stakeholders indicated that they liked 4-H and did not want its purpose to change. However, they were reluctant or unable to state the purpose of 4-H. Many respondents indicated that 4-H should expand opportunities for urban and suburban audiences. Some 4-H agents and specialists expressed difficulty in identifying a satisfactory role for themselves. Other responses indicated concern with new agents' orientation and adjustment during their first year on the job. Still other responses indicated a lack of clarity with the agent-volunteer relationship.

Respondents indicated different expectations for curriculum needs and for program delivery. Likewise materials for recruiting and training volunteers were identified as a need. Several new program suggestions were made by respondents especially to attract and retain teenage 4-H members. Underlying all of these proposals was the expressed need to maintain and increase financial support.

With regard to objective two, the inputs and results in Pennsylvania's current 4-H program were identified and described in a logic model (Figure 1). In addition activities and indicators of accomplishment were listed for each stage of the logic model. Faculty resources were specified which were necessary to complete each stage. The study committee also found that the logic model could be refined. They identified barriers in moving from one stage to the next of the logic model. They identified factors to reduce those barriers; they also identified intervening events and spin-offs. (Figure 3)

In comparing the professionals' program model with stakeholders' perceptions (objective three) the study committee found no conflicts. Stakeholders, particularly those who were volunteers or outsiders, were not aware of the entire logic model. All were aware of parts of the model. Some responses emphasized only agricultural or home economics subject matter.

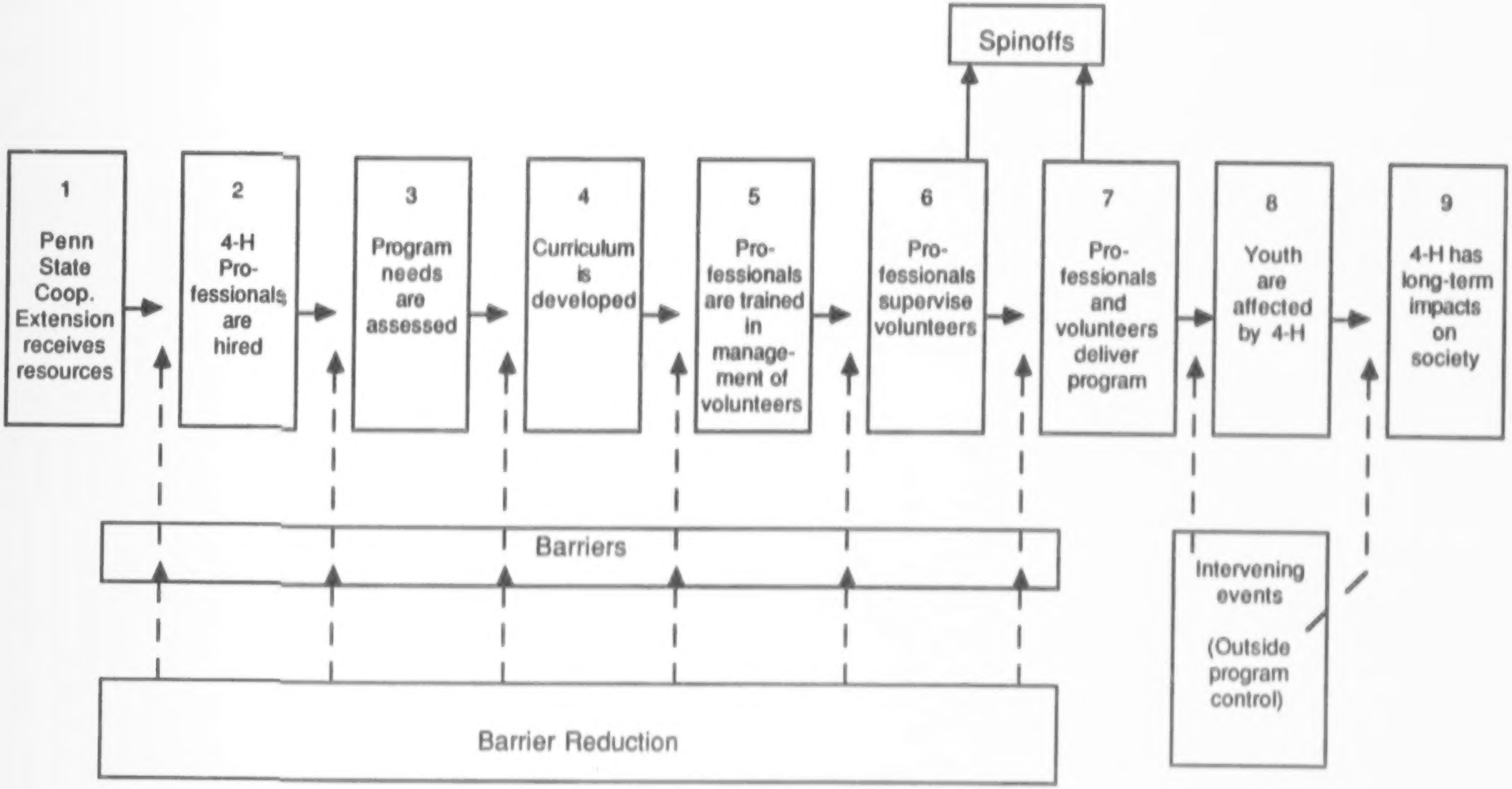
Spinoffs
1
Penn State Coop. Extension receives resources
2
4-H Pro-fessionals are hired
3
Program needs are assessed
4
Curriculum is developed
5
Pro-fessionals are trained in manage-ment of volunteers
6
Pro-fessionals supervise volunteers
7
Pro-fessionals and volunteers deliver program
8
Youth are affected by 4-H
9
4-H has long-term impacts on society
Barriers
Barrier Reduction
Intervening events
(Outside program control)

Figure 3

LOGIC MODEL -- PENNSYLVANIA 4-H

Recommendations

Based on these findings, study committee recommendations for objective one were to:

--inform stakeholders of program purpose,
--strengthen 4-H programming for urban and suburban youth,
--clarify the roles of county agents and state specialists in carrying out the program,
--implement the proposed orientation plan for new staff,
--clarify the agent-volunteer relationship,
--develop training materials for use with volunteers,
--describe an ideal curriculum development model and implement it,
--develop guidelines for program delivery,
--pilot test new approaches and programs for teens, and
--increase priority given to 4-H fund raising.

For objective two, the recommendations of the study committee were to:

--create and promote a realistic image of 4-H,
--develop and communicate a unified philosophy of the 4-H program, and
--develop a framework for communicating life skill effects of 4-H.

Recommendations related to objective three were to:

--organize communication with the various categories of stakeholders and communicate with them on a regular basis,
--make 4-H professionals aware of these recommendations as future programming efforts are developed,
--conduct further studies of 4-H program inputs and results, and
--use evaluability assessment with other Extension programs since it was less costly than an impact study, it clarified inputs and results that may have been overlooked by quantitative research, and therefore it is an appropriate method of qualitative research.

Conclusions

Support for Pennsylvania 4-H was expressed by representatives of all stakeholder groups. The study did not produce any major surprises or conflicts, but it did systematically document the perceptions of stakeholders. Recommendations were developed which detail actions needed to improve the effectiveness and extensiveness of the 4-H program.

The results of this study will be useful in future deliberations on 4-H programming priorities. The study has also provided a logic model that will be useful when designing a future impact study of the 4-H program in Pennsylvania. Evaluability assessment proved to be a useful research method to clarify inputs, results, and perceptions of a complex program. This conclusion was also supported by G. Mayeske, personal communication, March 28, 1989, regarding other Extension programs successfully studied using evaluability assessment.

Implications For Further Study

Further research on several topics is suggested by this study:

1. What are alternative approaches for increasing 4-H enrollment;
2. What needs of urban and suburban youth should 4-H address;

3. How do different stakeholder groups view the 4-H agent role;
4. What are new worker orientation models that might lessen the frustrations and shorten the period of adjustment;
5. What are some guidelines for an appropriate agent-volunteer relationship;
6. What curriculum development model would work best for Pennsylvania;
7. What are the best training models for volunteers;
8. Why do teenagers drop out or stay in 4-H;
9. What new curriculum materials are needed most;
10. Under what conditions are the various program delivery methods most effective;
11. What is the most useful needs assessment strategy for Pennsylvania 4-H;
12. What are the effects of 4-H on the youth and adult participants;
13. What are the long term impacts of 4-H on society; and
14. What are the strengths and weaknesses of the evaluability assessment process?

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